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Abstract

Included are suggestions for integrating conservation concepts into the general curriculum, coordinating outdoor work with indoor activities, and for planning and implementing a sequential conservation curriculum. Guidelines given for training of teachers include sample workshop schedules. Minimum requirements for outdoor school sites are listed. Charts are given listing conservation concepts with appropriate grade levels, and, for elementary grades, subject areas in which the concept can be stressed (fine arts, sciences, social studies, language arts, or mathematics). Suggestions for classroom approaches and presentations include a chart of grade level, student growth characteristics, and major science subject matter considered appropriate. Notes are given on subject matter for classroom presentation. Several sample high school conservation course outlines are included, and also a bibliography of some conservation teaching materials. (EB)

CONSERVATION TOOLS FOR EDUCATORS

PUTTING CONSERVATION TO WORK

RECEIVED
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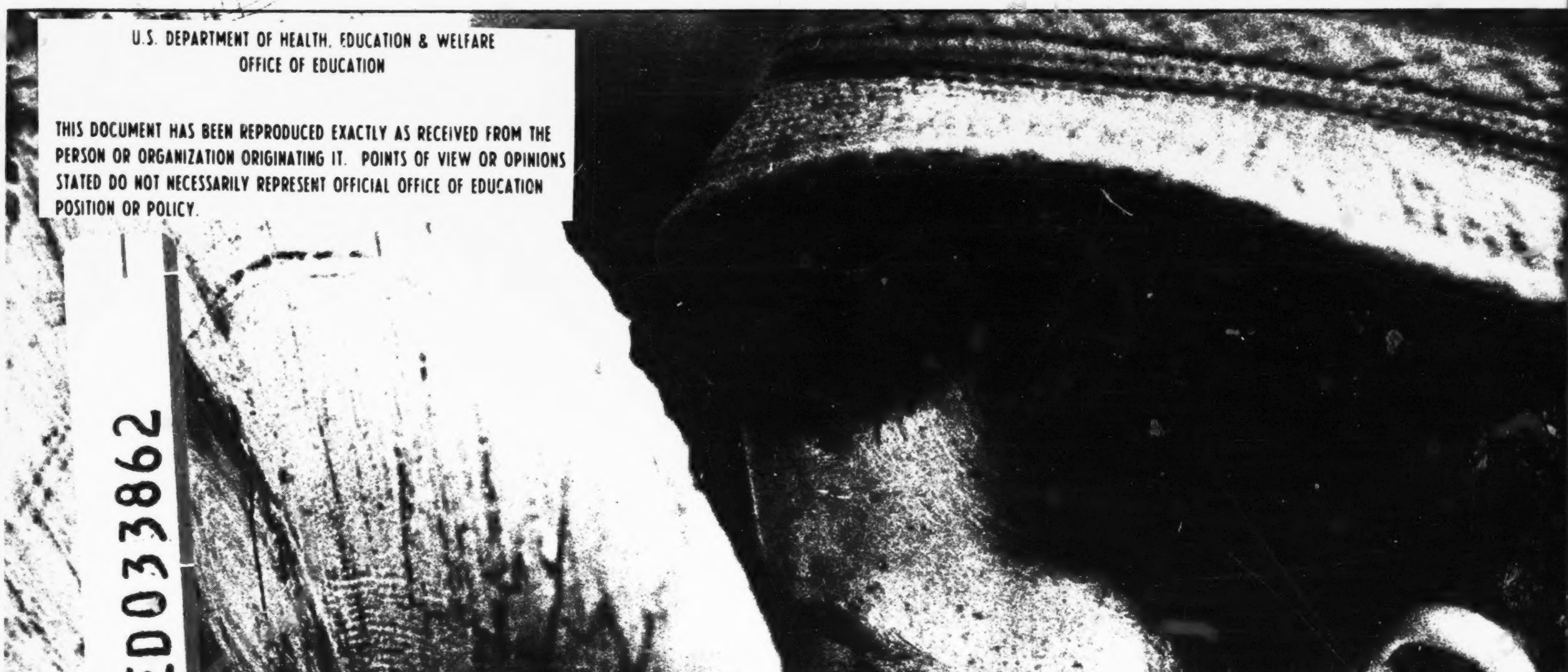

U.S. DEPARTMENT OF AGRICULTURE — FOREST SERVICE
PACIFIC NORTHWEST REGION

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Conservation Tools for Educators

Putting Conservation to Work Series

U. S. Department of Agriculture -- Forest Service
Pacific Northwest Region
1968

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For additional information on conservation and outdoor education programs, write:

Conservation Education Officer
U. S. Forest Service
P. O. Box 3623
Portland, Oregon 97208

INTRODUCTION

Natural resources play an important and integral part in our lives. Because we eat, breathe and live with these resources, it is important that people understand their importance.

Each person should have the opportunity to develop an awareness and appreciation of our resources and understand how they affect our lives. This opportunity can best take place in our schools and youth organizations. If the proper attitudes and behavioral patterns are developed there, these young men and women will be in a much better position to cope with the management and uses of our natural resources in the future. Since most attitudes and behaviorial patterns are formed during the youthful years, it is important that conservation learnings take place along with other learning processes.

Conservation education is not a separate course or area of study but simply one way of stressing the wise use of natural resources in the existing school courses.

Developing a conservation program in a school or classroom just doesn't happen. Like doing anything important, teaching conservation in the classroom takes sound planning and good preparation. It is the perfect "curriculum emphasis" with many of the basic concepts already found in subjects currently being taught in schools.

Since most young people are curious about nature and the out-of-doors, the teacher can capitalize on these interests to make learning more interesting and meaningful for the student by relating classroom learnings to outdoor subjects. Certainly the volume of a tree trunk is more fun to determine than the volume of a cylinder drawn on a page in a book. Social studies come alive when we relate our natural resources to those of other countries. Art becomes more meaningful when we know why a tree branches the way it does. A modern problems class has new dimension when economics, banking, or foreign trade are discussed in relation to our natural resources.

This booklet contains a few tools to help the teacher put conservation into the classroom. The U. S. Forest Service is indebted to many educators and resource people who have given generously of their time in helping to develop these tools, including the following:

Parkrose School District, Oregon

Lake Washington School District, Washington

Ohio Forestry Association, Inc.
(concepts chart)

Oregon State Game Commission

Washington State Department of Game

Soil Conservation Service

Washington State Department of Natural Resources

1 - CONSERVATION EDUCATION

School administrators, supervisors, and classroom teachers often ask: "What do we teach about in conservation?" Chapter 5 provides a logical listing of basic conservation concepts or beliefs that can be taught and understood at the suggested grade levels. The concepts listed for all 12 grades provide a sequence of learning, so that a student completing high school will have a better understanding about our natural resources and their effect upon our society.

The social studies and science courses are probably the best place to stress and illustrate these concepts and resource interrelationships, but many meaningful conservation experiences can be developed in art, music, mathematics, English composition, speech, etc.

Most projects will probably take place in the science curriculum, but social studies may also be used to point out the important part natural resources play in our lives socially and economically. Some concepts can best be learned in the indoor classroom, and some can best be learned in the outdoor classroom. The teacher must adapt the use of the basic concepts to fit the needs of the student. The suggested grade level for teaching the concepts in Chapter 5 is listed to provide a guide for the continuity of learning.

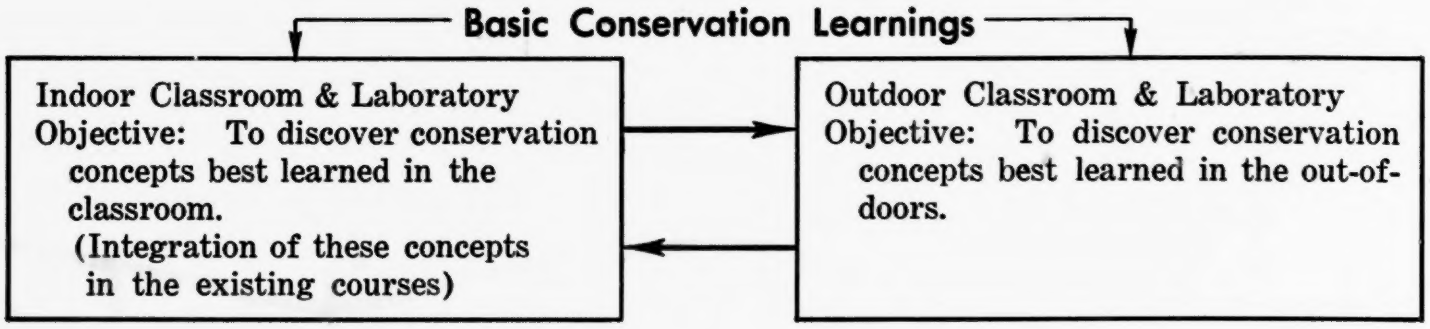
The teacher must decide how the understanding of these concepts can best be taught in her or his class. It might be integrating the concepts in the existing courses of study or exploring and expanding on several of the concepts by the unit study method.

The concepts also become a reference for the resource person who visits with school classes. The concepts can provide a starting point for his class presentation. In the initial conference with the teacher, the resource person can learn what the students already know about conservation and then develop his presentation around one or two of the appropriate conservation concepts for that grade level. This works equally well for indoor and outdoor presentations.

INDOOR VS. OUTOOR CLASSROOMS

In education we must consider all the environments in which children learn. If the study of earth sciences would be more meaningful outside the school building at the road cut where a soil profile is exposed, then that is where the study should start.

If it is more convenient to collect mushrooms and study them in the school room, then do it that way. Let's not overlook the potential of using the indoor and outdoor classroom to complement each other.



Basic Conservation Learnings

Indoor Classroom & Laboratory
Objective: To discover conservation concepts best learned in the classroom.
(Integration of these concepts in the existing courses)

Outdoor Classroom & Laboratory
Objective: To discover conservation concepts best learned in the out-of-doors.

Implementation

1. Emphasize concepts in existing courses in classroom by illustration and emphasis.
2. Classroom projects & activities.
3. Development of attitudes and proper learning climate in preparing students for the outdoor laboratory by using illustrations, projects, and activities in the classroom.

Implementation

1. Projects & activities to emphasize concepts learned in class room.
2. Projects and activities to illustrate concepts best learned in the out-of-doors.
3. Development of attitudes through involvement in meaningful activities in outdoor learning environment.

Integrating a Concept into the Curriculum

Grade Level: Intermediate

Concept: It is important that we use our present trees wisely.

Aims: To help students realize the value of trees for present and future generations.

To help students realize the many uses of trees.

To help students realize the time it takes to grow a new crop of trees.

Social Science Activities

Geography: Our most valuable tree species are in the southern and western U. S.

Government: 25% of the forest land in the U. S. is in government ownership. The other 75% is in private ownership.

History: Past timber harvesting practices helped settle the different regions of the United States.

Economics: One-half of the economy in Oregon is based on timber. Many jobs are dependent on keeping forest land productive.

Natural Sciences

1. Poor harvest practices cause soil erosion, loss of water supplies, siltation, pollution.
2. It takes many years to grow a tree to maturity.

Math Activities

How to measure a tree for board ft. volume.
Learn areas of forest land in different ownerships.

Language Arts

English
Comp: Write essay on "The Many Uses of Our Trees in Washington."
"Trees Were a Nuisance to the Pioneers."

Reading: Assignments to study above subjects.

Music: Discuss the meanings in songs about trees and forests.

Art: Draw pictures simulating and stressing textures of trees and plants.

(English composition, reading comprehension, typing, shorthand, etc., can be coordinated with social sciences, natural sciences, etc., to obtain best use of study assignments.)

Coordinating the Outdoor Laboratory into the Existing Curriculum

Grades	1	2	3	4	5	6	7	8	9	10	11	12
Objectives	Develop an awareness and appreciation of the out-of-doors and our natural resources.			Develop an appreciation and awareness of our natural resources and their uses.			Learn about the application of management and the effect of resources on society. To further the development of the appreciation of our natural resources and their use.					
NOTE:	Conservation Concept Scope and Sequence Chart is oriented to the objectives of the grade groupings and provides a continuity of learning and understanding about the resources. The outdoor classrooms listed below are oriented to provide a greater understanding and appreciation of our resources by learning in the outdoor learning situation.											
	Short field trips near school viewing and exploring various aspects of our resources. Example: take picnic take care of litter, fire visit parks pond forest seashore school yard trip			Nature trail. Field trip to points of interest: water works sawmill arboretum	County conservation tour	Outdoor school. If no outdoor school make sure students obtain objectives thru outdoor labs.	Revisit nature trail or outdoor lab to capitalize and expand on outdoor school experences.	Specialized field trips and conservation projects concerning concepts in Scope & Sequence Charts, e.g.: visit game farm soil & water project timber operation sawmill campground construction power dam County Planning Commission to see land zoning				

ESTABLISHING PROGRAMS

Many times individuals, civic organizations, teachers, or school administrators are interested in initiating conservation programs in the school but do not know how to proceed. These references can provide information for starting such programs.

The Program

The conservation and outdoor education program need not start with a complete committee. One or two people may be sufficient for the initial effort. Interest and leadership has often come from the school district's Director of Curriculum.

A beginning point might be some logical resource problem or project which can be studied in the classroom, such as a school beautification project. From this starting point conservation programs can spread to all grade levels.

The important thing is to plan toward a fully integrated program for all grades (K to 12). The Conservation Concepts in Chapter 5 can be a basic tool in this plan by providing a starting point and giving continuity of learning in the existing curriculum. Successful projects will ensure backing and interest in further development and accomplishment of the overall plan and objectives.

Conservation programs include:

1. Outdoor School — Usually one week of living and learning in the outdoor laboratory. (Usually for 6th graders because it is usually the last year of the self-contained classroom.)
2. Forest Conservation Tour — One day show-me trip set up with numbered stations (5th and 6th grades.)
3. Outdoor Laboratory (Example: nature trail with tour booklet for teacher. All grade levels.)
4. Specialized classes and field trips. (All grade levels.)
5. Teaching of one resource at each grade level.
6. Fully integrated program based on Conservation Scope & Sequence Chart combining indoor and outdoor learnings (Grades 1 to 12).
7. Some youth organization programs, such as the 4-H Forestry Program, could be adapted to fit into the school program.

Some Schools with Specific Programs

1. Resident Outdoor Schools

   Milwaukee School District, Milwaukee, Oregon
   Highline School District, Seattle, Washington
   Naches School District, Naches, Washington
   McMinnville School District, McMinnville, Oregon

2. Outdoor Laboratories

   Maple Valley Schools, Maple Valley, Washington
   Portland City and Multnomah County Schools in Forest Park, Oregon
   Tomolla Tree Farm, Orting, Washington

3. Individual grade teaching guides

   Crook County Schools, Prineville, Oregon
   Bend City Schools, Bend, Oregon

4. Fully integrated school programs with use of the Basic Conservation Concept & Sequence Chart (involving indoor and outdoor experiences).

   Parkrose School District, 19612 N. E. Prescott, Portland, Oregon

5. High School Conservation and forestry courses.

   Lincoln High School, Dave Trier, Tacoma, Washington
   Bend High School, Charles Beckley, Bend, Oregon

Some Contacts to Help Initiate and Implement the Program

All requests for assistance in setting up programs in Oregon or Washington should be sent to either:

Mr. George Katagri, Consultant on Science, Conservation, and Outdoor Education, State Department of Education, Salem, Oregon.

Mr. James Garner, Consultant on Science and Conservation Education, Office of the Superintendent of Public Instruction, Olympia, Washington.

1. Some agencies and organizations that can provide assistance:

    School Districts and teachers already involved in programs

    Oregon State Game Commission

    Oregon State Forestry Department

    U. S. Soil Conservation Service

    U. S. Forest Service

    American Forest Products Industries, Inc.

    Oregon State Extension Service

    Natural Resources Forum of Washington

    Washington State Department of Game

    Washington State Department of Natural Resources

    Washington State Extension Service

    Bureau of Land Management

    U. S. Fish and Wildlife Service

    U. S. Park Service

    Universities and Colleges

2. In the community you may find help from organizations such as:
    1. Parent Teacher Association
    2. Local School Board
    3. Service Groups
    5. Citizens Advisory Committees
    6. Local Soil & Water Conservation District
    7. Sportsmans groups
    8. Garden Clubs
    9. Local timber, lumber, paper, or other resource using companies.

Conservation Libraries

A "conservation shelf" in a school or public library can be a good start toward furthering conservation interest among the students and teachers.

Contact should be made with the librarian to determine if shelf space can be provided for books and pamphlets. Conservation books already in the library could be gathered on the shelf. A colorful sign over the books could promote interest.

Conservation material can be donated as gifts for contest awards and memorials. The initial contribution should be made with appropriate ceremony.

Regular donations could be made to the shelf. Suitable occasions might include Conservation Week, Soil Stewardship Week, National Wildlife Week, Library Week, Arbor Day, etc. The librarian should normally be consulted when making selections. The bibliography in Chapter 9 may be of assistance in selection of books.

Local publicity will help to stimulate this project.

Many service clubs might be interested in coordination or participation in such a project.

Role of School District Administrative Staff

The administrative staff of the School District has a definite responsibility in the development of a district-wide program of conservation. While an effective course of study can only be developed with the help and cooperation of the teachers is essential to the success of the program.

The principals, teachers and other members of the district administrative staff may best implement a conservative program in our schools in the following manner:

1. School District Level
    - a. Provide conservation workshops for staff members.
    - b. Maintain an up-to-date file of resource people available for school visitations.
    - c. Establish a scope and sequence of conservation education beliefs or concepts.
    - d. Recommend the development of conservation outdoor sites.
        - (1) Public lands at all government levels
        - (2) Other available lands adjacent to schools

e. Develop resource kits to be available to individual buildings and teachers.

f. Study possibility of an outdoor education program.

2. School Building Level

   a. Provide enthusiastic support of the conservation program.

   b. Establish a library of conservation materials.

   c. Establish a planned program of conservation field trips.

   d. Orient the staff to the importance of a conservation program.

   e. Make provisions for assembly programs and conservation displays.

   f. List the parents and staff who have backgrounds and interests that can be useful as resource people for the conservation program.

3. Teacher or Classroom Level

   a. Implement conservation learnings into the existing curriculum (See Scope & Sequence Chart, Chapter 4).

   b. Develop an appreciation and awareness of the importance of our natural resources for themselves and their students.

   c. Contribute conservation projects and activities to the conservation library.

   d. Promote and carry the conservation program to new teachers in the building and District.

   e. Use conservation as an aid to stimulate and make learning more meaningful for the students.

RECIPE FOR PUTTING CONSERVATION TO WORK

Start with a convinced educator

(a teacher, principal, curriculum director, etc.)

Add by convincing the school administration

(Take staff on show-me trip to resource management areas, existing school programs, etc.)

Stir by forming a conservation and outdoor education committee of teachers and resource consultants

(Identify important conservation and outdoor education learnings)

(Teachers know how to teach)

(Resource people know what to teach)

Blend by developing source material

(Develop necessary written source materials and tools of how to integrate or correlate conservation into the curriculum such as "Putting Conservation to Work" booklets)

Bake by providing in-service workshops for teachers

(Give teachers some basic resource information and techniques of using outdoors as a part of the total learning environment)

Ice and Serve to students (by the teachers) as a part of the normal school curriculum.

Utilize the outdoors to enrich and vitalize learning objectives.
(Learn the things that can best be learned indoors, indoors; and the things that can best be learned outdoors, outdoors — L. B. Sharp)

2 - TEACHER TRAINING

Teachers who do not have extensive backgrounds in conservation and outdoor education should be encouraged to gain this background. There are several ways to receive training in conservation and outdoor education.

COLLEGE CONSERVATION WORKSHOPS

Some colleges have established teacher workshops on conservation and outdoor education. These workshops present basic information about natural resources, resource management problems, and explore how this information can be taught in the classroom. They are one or two weeks long and are held in the summer. Graduate college credit is given, depending on the type of workshop offered. Workshops in Oregon and Washington include:

1. Central Washington College, Ellensburg, Washington — June
2. Pacific Lutheran University, Tacoma, Washington — June
3. Division of Continuing Education, 1632 S. W. Park, Portland, Oregon
   Conservation — August
   Water Utilization — August
4. Oregon State University, Corvallis, Oregon — June
5. Southern Oregon College, Ashland, Oregon — Three workshops: June, July, and August
6. Eastern Washington State College, Cheney, Washington — July
7. Western Washington State College, Bellingham, Washington — July

IN-SERVICE CONSERVATION WORKSHOPS

There are many opportunities to hold conservation education teacher workshops at the local, district and county school levels.

These workshops can be offered as a part of the *adult education programs*, *in-service professional credit workshops*, or *for college credit*.

Most schools hold teacher orientation sessions and institutes throughout the year. A one-half day, one-day or two-day conservation workshop during these institutes is a good way for teachers to gain a better understanding of our natural resources, and how conservation of natural resources can be integrated into the existing courses at all grade levels.

Resource People as Teachers or Instructors

There are usually resource people in each community that can participate as instructors in such workshops.

A discussion of the resource, its importance to man and to the other resources, problems of management, and possible solutions to man-made problems, will cover the major facets of the resource presentations.

Some possible sources of resource people:

Bureau of Land Management
County Agent
U. S. Soil Conservation Service
State Game Commission
State Forestry Department
Local wood manufacturing company
Local power company
U. S. Forest Service
State and local agencies concerned with the various resources
U. S. Park Service
U. S. Water Pollution Control Admin.

Administration

The local education administration interested in the workshops should provide the overall administration of the scheduling, registration, etc. A local resource person may be able to help by contacting resource people as lecturers and helping to plan the field trips.

Workshops

Several approaches to the "short term in-service" conservation workshops are listed here.

These workshops should be flexible in timing and schedule.

A Four-hour Workshop

This length of workshop can be fitted into most teacher institutes.

1 Hr. — Introduction

Discuss philosophies of conservation education, different areas of study, Scope & Sequence Chart, what to teach, show film depicting all resources. (Example: "Web of Life")

1 Hr. 40 Min. — Resource Presentation

Short presentation on each resource. (Use slides or visual aids, if possible.)

Soil	15 min.
Minerals	5 min.
Water	15 min.
Plants (wood-forage)	15 min.
Recreation	10 min.
Interrelationship of resources to one another and to man	15 min.
Questions and answers	15 min.

30 Min. — Discussion Groups

Exercise on integrating basic conservation concepts or learnings into the existing disciplines.

Break into discussion groups of primary teachers (grades 1-3), intermediate (grades 4-6), junior high school (grades 7-9), senior high school (grades 10-12), and discuss the topic "How can we integrate study of natural resource conservation into the existing curriculum?" Have recorder take notes.

25 Min. — Report of Each Discussion Group Recorder

10 Min. — Conclusions

TOTAL — 3 Hrs., 45 Min.

NOTE: This program could be expanded to a full day by taking teachers around schoolyard and exploring ways to use outdoors as a classroom.

A One Day "Outdoor Laboratory" Workshop

9:00 AM Arrive at area and assemble for orientation to field study. Gather into groups of about 20 each.

9:30 AM Group Study Areas

Time	Groups		
	I	II	III
9:30-11:00 AM	Soils	Plants	Wildlife
11:00-12:30 PM	Wildlife	Soils	Plants
12:30- 1:30 PM	Lunch (Barbecue)		
1:30- 3:00 PM	Plants	Wildlife	Soils

3:00- 4:00 PM Evaluation

1. Form discussion groups by grade level: 1-3, 4-6, 7-8, and 9-12. A discussion leader and recorder will be assigned in each group.
2. Brainstorm the topic "How can we integrate the use and study of this outdoor laboratory into our present classes?"

4:00 PM Dismissed

Each resource group would participate in doing activities to better understand the resources and their interrelationships on the area.

For Example: Soil — Make micromonoliths, feel and see soil structure, texture, observe soil-plant relationships, etc.

Plants — Use increment borers, tree identification, plant competition, determine tree volume, take range transects, plant, soil, animal relationships.

Wildlife — Find evidence of wildlife, discuss and construct wildlife habitat, discuss and observe animal, plant, soil, water relationships.

A One Day Resource Field Trip Workshop

(Field trip should cover a variety of resource areas)

0 Miles —	Leave Lake Washington High School	8:00 AM
	Discuss and point out enroute to Carnation Farms: 1. Water pollution problems. 2. Urbanization problems (space), housing encroachment on agricultural land, land values. 3. Additional land uses seen enroute.	
17 Miles —	Arrive Carnation Farms	9:00-10:00 AM
	Discuss land use practices — stream channel work, pasture rotation, tree farm, land use economics.	
	Travel to Tokul Fish Hatchery	10:00-10:30 AM
32 Miles —	Tour Fish Hatchery	10:30-11:15 AM
34 Miles —	Travel to Snoqualmie Falls Power House	11:15-11:30 AM
	Discuss power, recreation and impact of both on economy of area.	
	Travel to Snoqualmie Falls Lodge (lunch)	12:00- 1:45 PM
	Travel to Weyerhaeuser Demonstration Area	1:45- 2:00 PM

45 Miles —	Weyerhaeuser Demonstration Area Discuss timber stand improvement program, wood products, forest competition, etc. (tour nature trail).	2:00- 3:00 PM
	Leave for High School	3:30 PM
90 Miles —	Arrive High School	4:00 PM

Program for 3-Credit Conservation Education Course

(*Can be offered as a 3-credit workshop*)

Date	*Topic*	*Resource Person*
1st Class	Discuss basic philosophies of resource mgt. and conservation education, asassignments. Show film WEB OF LIFE.	
2nd Class	Resource class — Soil & Minerals	
3rd Class	Resource class — Water	
4th Class	Resource class — Plants	
5th Class	Resource class — Wildlife	
6th Class	Resource class — developing and use of the outdoor laboratory	

Each class meets 7:00 to 10:00 PM

Date	*Topic*	*Resource Person*
7th Class Saturday	All day outdoor classroom session (see outdoor laboratory workshop schedule)	
8th Class Saturday	All day field trip to view some of the resources and resource management problems in the area.	
9th Class	Summary — Implications of outdoor education vs. indoor education.	

Suggested Combination of Workshop Programs

1. 1½-Day Workshop

   A combination of the 4-hour or ½-day indoor and the 1-day outdoor field lab makes a good 1½-day workshop. The indoor workshop provides a basic understanding so that more learning can take place in the outdoor laboratory.

2. 2-Day Workshop

   A combination of the "outdoor laboratory" workshop and the show-me trip gives the teachers some tools to use and a look-see at field trip possibilities in their local area.

3. 2½-Day Workshop

   A combination of the ½- and two 1-day workshops can provide good understandings of the importance of our resources and how to use this information effectively in the indoor and outdoor classrooms.

4. 9-Week or 3-Credit Workshop

   This workshop can be offered as a 3-credit in-service professional or graduate college credit. It gives basic background information in making learning more interesting and meaningful.

   If this workshop is held in the fall of the year, the field sessions could be held first; if held in the spring, the field sessions should be toward the end of the workshop to take best advantage of good weather.

WORKSHOP EVALUATION

The assignment or evaluation paper should be used to stimulate teachers to think of ways to use the resource information in her or his own teaching situation. This exercise will enable the teacher to formulate ideas and projects for immediate use and can also be the start of the school guide for teaching conservation in the classroom.

Listed below are several assignments that could be used for the final evaluation. The local school districts should use the one that best suits its needs.

1. Explain how you or a teacher in this situation could develop field experiences in conservation for your teaching assignment.
2. List examples by which you can correlate conservation of natural resources with:
    a. Social Studies
    b. Science
    c. Mathematics
    d. Art
    e. Language Arts
3. Select one of the objectives below and tell how you would develop it in your classroom learning situation.
   Objectives:
    a. To understand how important conservation is to the well-being of the community and nation.
    b. To gain an appreciation of the natural resources and an understanding of their usefulness to man.
    c. To understand that the conservation of soil, water, plants, and animals is interrelated, such as conserving the birds that eat insects that destroy our trees.

3 - OUTDOOR SCHOOL SITES

There is a growing interest and demand on the part of our schools, and youth organizations nation-wide, for land or sites adaptable for outdoor school programs as part of the school curriculum or for summer youth organization programs. The opportunity for youth to gain first-hand knowledge about the important part that natural resources play in our society and the interrelationships of one resource (including human) to another can best take place in the outdoor laboratory.

The outdoor school usually lasts 3-5 days in a social living and outdoor classroom experience at the outdoor school site. Some school districts would use sites yearlong. These outdoor experiences help the youth develop the proper attitudes toward use, care and management of our natural resources.

These attitudes are also necessary to reduce some of the mass recreation use problems found in our public recreation facilities today. Outdoor school and youth organization programs can do much to develop these attitudes and appreciations in our youth.

Additional outdoor school land sites and youth organizational sites are needed to provide the opportunity for these educational programs to be accomplished.

The criteria for an outdoor school site can be different than for the "perfect" recreational organizational site. The outdoor school is concerned with exploring the scientific and social interrelationships of natural resources. The emphasis is for a variety of natural resources, topography, etc., and therefore, lakeshore frontage (for example) for the development of an aquatics program is not essential.

As long as access to a variety of natural resources is available, the actual site for development of the buildings, etc., would not usually be over 5-10 acres. This is the portion, for example, that would be leased or put under a Special Use Permit, if located on public lands.

Listed below are minimum site requirements for an outdoor school as adopted by Superintendent of Public Instruction, State of Oregon.

I. Site

1. The site is located within a 75-mile radius (1½ hrs. driving) of a school center.

2. The site provides for maximum privacy (away from populated areas).

3. The site provides abundant natural resources and varied topography to enrich an outdoor living experience. (Mixed timber types, variety of plant and animal life native to the area, fields, hedgerows, ponds, streams, deserts, lakes, oceans, hills, mountains are examples of natural resources).

4. The site, including contiguous areas, is of adequate size for the number of students using it at any one time. (One or more acres per student camper). (Note: The actual site for the plant facilities listed below in II is the portion that would be put under special use permit, if located on public lands ((approx. 5-10 acres)). The contiguous area would then be available as outdoor classroom.)

5. The site is free from unnecessary hazards. (Unprotected cliffs, pits, treacherous waters, poisonous plants, poisonous snakes, danger snags, insect pests).

6. The site has a good year-round access road leading into the property.

7. The site provides for an adequate parking area for at least 15 cars.

8. The site provides for effective drainage in the living and activity areas.

9. The site is located near a source for convenient delivery of supplies and for emergency medical services.

10. The site has an adequate supply of potable water.

11. The site must be adaptable to the development of sanitary facilities that comply with all local, county and state sanitation laws.

12. The site provides for an open playfield area.

II. Facilities and Equipment Needed for Optimum Operation

1. The site has winterized separate living areas for boys and girls to accommodate 120 students, plus supervisorial staff.

   Each separate living area must provide for the following minimal standards:

   a. Accommodates a minimum of 30 students with separate buildings or rooms to house 8 to 10.

   b. Provides living accommodations for counseling staff. (Ratio: 1 staff person for each 8 to 10).

   c. Provides for indoor day rooms large enough to accommodate 30 students for meetings and leisure use.

   d. Provides hot water facilities for bathing purposes. (Ratio: 1 showerhead to every 10 persons).

   e. Provides toilet facilities adequate in number. (Ratio: 1 seat per 10 persons, except in boys' areas with urinals; 1 seat for every 15 persons and 1 urinal for every 30.)

   f. Provides for handwashing facilities in proximity to all toilets and urinals. (Within 20 ft. of the toilet facilities. There should be a ratio of one wash sink to each 15 persons.)

2. The site provides separate living quarters for a minimum of 15 staff and guests.

3. The site provides for a modern dining and kitchen facility to accommodate a minimum of 150 persons.

4. The site provides for an administration building space, that includes a gathering place for supervisory staff to hold meetings and to use during their free time.

5. The site provides for an infirmary with isolation quarters.

6. The site provides for a recreation building that will accommodate a minimum of 150 persons for indoor gatherings and space for a library, nature museum, trading post, storage of tools and other equipment.

7. The site provides space for a laundry and drying room.

8. All facilities should be constructed in accordance with school building codes.

4 - CONSERVATION AND THE SCHOOL CURRICULUM

The concepts and activities in this chapter were compiled by teachers and resource people as an aid to integrating and stressing conservation in the existing curriculum.

Following each concept is a short explanation and expansion of that concept for the teacher's references.

The activities, projects, and illustrations listed under each concept are only basic ideas and can be modified to fit the teacher's own situation.

The curriculum areas listed at the right hand edge of the page for the elementary grades indicate that the corresponding concept might best be illustrated and explored in those subjects. This is to help the teacher decide where the concept can best be integrated. The coding is: F.A. — fine arts, Sc — science, S.S. — social studies, L.A. — language arts, Math. — mathematics.

Many of the concepts are adapted from the Ohio Forestry Association concepts chart.

Conservation Concepts for Grades 1 - 6

PRIMARY GRADES (1 - 2 - 3)

Objectives: Develop an awareness and appreciation of the out-of-doors and our natural resources.

INTERMEDIATE GRADES (4 - 5 - 6)

Objectives: Develop an appreciation and awareness of our natural resources and their uses.

General Concepts

Suggested Grade Level for Teaching	*Concept*
1, 2, 3	CONSERVATION IS USING THINGS WE NEED IN SUCH A WAY THAT WE CAN KEEP ON USING THEM.
1, 2, 3	NATURAL RESOURCES ARE USED TO SUPPLY THE WANTS AND NEEDS OF PEOPLE; WE NEED RESOURCES FOR FOOD, CLOTHING, AND SHELTER.
1, 2, 3	MANY RESOURCES ARE LOST OR IMPAIRED THROUGH WASTEFUL USE.
1, 2, 3	WE HAVE A RESPONSIBILITY TO HELP OTHERS LEARN HOW TO USE NATURAL RESOURCES BETTER.
1, 2, 3	A FOREST IS A COMMUNITY OF PLANTS AND ANIMALS DEPENDENT UPON EACH OTHER.
3	LAWS ARE NECESSARY TO PROTECT NATURAL RESOURCES, AND SHOULD BE RESPECTED.
4, 5, 6	WE DO NOT ALWAYS HAVE ALL THE RESOURCES WE NEED. SOMETIMES WE CAN SUBSTITUTE RESOURCES.
4, 5, 6	CONSERVATION IS USING NATURAL RESOURCES IN WAYS THAT WILL PROVIDE FOR FUTURE USE.
4, 5, 6	NATURAL RESOURCES ARE ESSENTIAL IN MEETING MAN'S NEEDS FOR FOOD, CLOTHING, SHELTER, POWER, MACHINES, ROOM FOR LIVING, AND RECREATION. THE ABUNDANCE OR SCARCITY OF NATURAL RESOURCES USED BY ANY CULTURE AFFECTS THE PROGRESS OF THE CULTURE AND THE WELFARE OF ITS PEOPLE.
4, 5, 6	LONG-RANGE CONSERVATION IS BOTH ESSENTIAL AND PRACTICAL FOR OUR WELL BEING. GOVERNMENTAL AGENCIES DIRECT THE MANAGEMENT OF PUBLICLY-OWNED RESOURCES AND HELP PRIVATE LANDOWNERS MANAGE THEIR RESOURCES.
4, 5, 6	LAWS ARE SOMETIMES NECESSARY TO ENSURE EQUAL OPPORTUNITY FOR THE USE OF OUR NATURAL RESOURCES.
5, 6	EVERY COUNTRY HAS SOME RESOURCES, BUT NO COUNTRY HAS ALL THE NATURAL RESOURCES A MODERN CIVILIZATION NEEDS.
5, 6	ALL THINGS IN NATURE ARE CONTROLLED BY NATURAL LAWS, AND MAN MUST UNDERSTAND THESE LAWS TO USE NATURAL RESOURCES INTELLIGENTLY. THERE IS NEED FOR BETTER APPLICATION OF THE KNOWLEDGE WE ALREADY HAVE AND FOR CONTINUED SEARCH FOR NEW KNOWLEDGE ABOUT OUR NATURAL LAWS.

Soil Concepts

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
1, 2, 3	SOIL GIVES US FOOD, CLOTHING, SHELTER. From the soil comes food, such as potatoes, fruit; clothing, such as cotton; and shelter, such as wood from trees. 1. Plant vegetable seeds at school — harvest products. 2. Make picture display of shelters made from plants grown in the soil. 3. Draw picture display of clothing that comes from plants.	F.A., Sc., S.S., L.A., Math.
1, 2, 3	THERE ARE MANY KINDS OF SOIL. Soils can be made of different sized particles such as clay, sand or gravel. Soils are formed from many mechanical and climatic conditions. 1. Bring soil samples from home and different places, feel and see differences. 2. Rub soft rocks together to demonstrate how soil is made.	Sc.
2, 3	SOIL IS THE BASIC RESOURCE. All living things depend on soil directly or indirectly. Soil provides the nutrients, minerals and moisture that plants need to live. Animals need plants for food. 1. Study and draw food chain (elementary version). 2. Relate planting of seeds to plant requirements needed from the soil.	Sc., S.S.
2, 3	SOIL IS THE HOME OF MANY LIVING THINGS. Millions of living things, such as bacteria, fungi, insects, earthworms, other animals and plants live in the soil. Because of these living things, the soil is dynamic and ever changing. 1. Bring topsoil to class and investigate the living organisms in it: Use hand lens, microscope and naked eye. 2. Place earthworm in jar of soil and make daily observations of habits.	Sc., S.S.
3	SOIL CAN BE SAVED FROM WASHING AND BLOWING AWAY. Most erosion is caused by wind or water motion. Rich soil that erodes becomes poor soil. Erosion can be prevented or controlled if the land is protected by plant cover. 1. Pour water over bare soil with sod on it, as a project in classroom, to watch effects of soil erosion due to water. 2. Germinate seeds on a sponge to show root matting, leading to an understanding of how roots can help hold soil in place.	Sc., S.S.
4, 5	IRRIGATION, DRAINAGE AND VEGETATION CAN BRING LANDS INTO USEFUL PRODUCTION. By removing excess water from some lands, adding water through irrigation to arid lands and removing brush, sagebrush, etc. from those lands which are suitable for cultivation, we can bring more land into the production of food or fibre. 1. Study irrigation and vegetation removal of lands in the Columbia River Basin and Eastern Oregon. 2. Field trip to local farms to view drainage and irrigation projects.	S.S., L.A.
4, 5, 6	SOIL IS THE BASIC RESOURCE. ALL LIVING THINGS DEPEND ON SOIL DIRECTLY OR INDIRECTLY. Most plants depend on the soil directly for moisture, nutrients and minerals. All animals depend on plants, which depend upon the soil, for food. Trace food chain. 1. Trace the existence of an animal back through the food chain to its basic food supply — the soil. 2. Write paper on how plants depend on soil.	Sc., S.S., L.A.
4, 5, 6	SOIL IS MADE FIRST FROM ROCKS BY GEOLOGIC PROCESSES WHICH ARE SLOW AND CONTINUOUS. The small mineral soil particles come from a rock material. The process of breaking down from rock to soil takes a great span of time. Soils are still being formed at a slow process, dependent on variables such as temperature, moisture, freezing, thawing, etc. 1. Rub soft rocks together to make soil. 2. Look at soil through microscope to notice different size particles. 3. Discuss major steps of soil formation. 4. Heat rocks and drop into ice water to observe cracking.	Sc.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
4, 5, 6	SOIL IS THE HOME OF MANY LIVING THINGS. Bacteria, fungi, earthworms, bugs and many living plants and animals make their home in the soil. They help to break down the soil particles and the organic matter which changes the structure of the soil. 1. List all animals that we know live in the ground. 2. Bring samples of topsoil to class and investigate for living organisms. 3. Find and read stories and poems of animals that live in the soil.	Sc., F.A., L.A.
4, 5, 6	SOILS DIFFER WIDELY AND SOILS ARE FORMED IN LAYERS THAT DIFFER IN TEXTURE, ORGANIC MATTER, STRUCTURE, WATER-HOLDING CAPACITY AND FERTILITY. The soil is a thin skin over the surface of the earth. Soils, like people, go through a change from youth to old age. These changes are predictable and the extent of change is influenced by the parent material, environmental factors, and the use to which the soil has been put during its lifetime. 1. Study different layers of soil in cut bank or at new basement excavation. 2. Experiment with organic matter and water holding capacity of different soils; plant seeds in different soils. 3. Sixth grade make soil chart from soil pit and label soil horizons.	Sc.
4, 5, 6	SOIL IS ERODED BY WIND AND WATER. Plant cover can protect the soil from washing or blowing away. The processes of soil formation and erosion have been going on since time began. This is natural geologic erosion. Man's use and misuse of the soil has in some cases caused accelerated unnatural erosion. 1. Make displays of differences of wind and water erosion. 2. Explore differences between natural and man-caused erosion. 3. Blow air from fan across boxes containing dry bare soil and soil with vegetation on it.	Sc., S.S.
4, 5, 6	SOIL CAN BE SAVED BY PROPER USE AND MANAGEMENT. If we cultivate only lands suitable for cultivation, and by using proper land management techniques (contour plowing, strip cropping, etc.) we can use our soils without deteriorating them. We can save soil by avoiding unnecessary and unseasonal denudation or disturbance, by restoring denuded and disturbed areas, by avoiding compaction that breaks down soil structure, etc. 1. Visit farm to view different cultivation techniques used to keep soil in place. 2. Use pans of soil and contour vertically and horizontally.	Sc., S.S., Math.
5, 6	OUR THIN MANTLE OF TOPSOIL IS VERY IMPORTANT TO US. The part of the surface of the land which grows plants is a very thin layer. Most of the plant requirements in the soil are found in the upper 18 inches. Some roots go deeper in search of moisture, depending on the depth and texture of the soil. 1. Grow plants in subsoil and topsoil and observe differences. 2. Observe differences in both dry and wet topsoil and subsoil.	Sc.
5, 6	SOIL IS A RESERVOIR THAT HOLDS WATER. Soil percolates into the soil and is stored between soil particles, in caverns, underground streams, etc. Each soil can only hold a certain amount of water depending on soil depth, texture, etc. Soil is also a filter that cleans water. 1. Take field trip to watershed or forested area — note ground cover in dense shade and open areas. Compare moisture content of topsoil. 2. Discuss water table and differences of soil in water-holding capacities.	Sc., S.S.
5, 6	SOIL CONSERVATION IS EVERYONE'S RESPONSIBILITY. As long as human beings need food, clothing and shelter, they are dependent on the continued productivity of the soil. 1. Discuss ways we can help conserve soil at home, camping, etc. 2. Have students write essays on their responsibilities, as citizens, toward soil conservation.	S.S., L.A.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
5, 6	SOIL EROSION HAS CHANGED THE LIVES OF THE PEOPLE OF OUR NATION AND OTHER NATIONS. The loss of soil means loss of crop production capacity which in the face of increasing population could mean starvation. Whole civilizations have vanished in past history because of loss of soil. 1. Study "dust bowl" area and migration of people due to erosion. 2. Study depletion of appropriate land areas due to mismanagement of soil in those areas. 3. Discuss effects (good or bad) of alluvial fans of rivers.	S.S.
5, 6	SOIL CAN BE USED BY OUR FUTURE GENERATIONS IF WE MANAGE IT WISELY. 1. Emphasize and study conclusions made in concepts already covered. 2. Oral reports on above.	S.S., L.A.
5, 6	GOVERNMENT AGENCIES AND PRIVATE LANDOWNERS ARE WORKING TO CONSERVE OUR SOILS. These people are concerning themselves with the soil conservation problems by giving technical and financial assistance to landowners. Government agencies and landowners have substituted soil conservation programs on the lands they administer. 1. Study cooperative program and technical advice available.	Sc., S.S., L.A.
6	PHYSICAL, CHEMICAL AND BIOLOGICAL PROCESSES MAKE PLANT FOODS IN THE SOIL. The breaking down of the soil particles by the preceding processes releases elements such as iron, calcium, etc., and makes them available for plants to use. When the soils are being used, heavily supplemental amounts of plant foods need to be added. 1. Test for mineral and chemical contents in soil. 2. Test for physical size of particles and texture of soil.	Sc.

Mineral Concepts

1, 2, 3	MINERALS INCLUDE EVERYTHING FROM THE GROUND EXCEPT PLANTS AND ANIMALS. Minerals include all inert material from the ground. Some minerals are derived from living things. Minerals are non-renewable resources. Once the supply is exhausted, a new deposit or a substitute must be found. 1. Collect minerals and rocks. Investigate and determine these are nonliving. 2. Crack a rock and notice the colors and structures of granules which indicate different minerals.	Sc.
1, 2, 3	ROCKS ARE MADE OF MINERALS. Some minerals are valuable as gems and some are so common as to have no commercial value. 1. Test for different minerals, such as limestone, by using vinegar.	Sc.
1, 2, 3	THERE ARE MANY KINDS OF ROCKS. 1. Make collection and a chart of where different rocks were found. 2. Invite someone from the community who is a rockhound to show his collection.	Sc., L.A.
1, 2, 3	SOME ROCKS ARE USED FOR BUILDINGS AND ROAD SURFACING. 1. Take field trip to observe road surfacing. 2. Take field trip to observe buildings and houses made of rock.	F.A., Sc., S.S.
1, 2, 3	ROCKS ARE PART OF THE SCENERY WHICH WE ENJOY. Many unique rock formations are valuable for aesthetic values of just looking at or to be used as recreation activities, such as rock climbing. 1. Visit scenic rocks in your area. 2. List, bring pictures, make bulletin boards of scenic rocks.	F.A., S.S.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
2, 3	WEATHERING BREAKS UP ROCKS. Freezing, thawing, heating and cooling, help to break rocks into smaller pieces. Plants, such as lichens, also help break rocks into smaller pieces. 1. Freeze rock in pan to show how it cracks when frozen. Heat rock, drop it into water. 2. Discuss wind and glacial action.	Sc.
2, 3	THE SOIL IS PARTLY MADE UP OF WEATHERED ROCKS. The other part of the soil is the decayed organic material, such as plants and animals. 1. Rub two rocks together and check residue for rock particles. 2. Refer to the same soil concept.	Sc.
2, 3	MINERALS ARE NEEDED TO MAKE MANY THINGS. Useful products, such as automobiles and toys, are made from minerals. Our food has many minerals in it, too. 1. List and discuss the uses of rocks and minerals in our lives. 2. Discuss how some minerals, such as iron, can be used over again.	Sc., S.S.
3	COAL, OIL, AND GAS ARE ALSO MINERALS. THEY ARE USED IN MANY WAYS. 1. Make displays showing uses of these minerals. These are fossil minerals. Discuss how these were formed.	Sc., S.S., L.A.
4, 5, 6	COAL, OIL, AND GAS ARE ALSO MINERALS. THEY ARE USED IN MANY WAYS. 1. Be able to recite where our nation's coal, oil and natural gas come from, and give six products or ways in which these minerals are used. 2. Discuss formation and extraction of these minerals. 3. Construct models of how these minerals are taken from the ground.	F.A., Sc., S.S., L.A., Math.
4, 5, 6	ROCKS ARE PART OF THE SCENERY WHICH WE ENJOY. Scenic rock formations are often preserved in parks. 1. Locate on state map the State Parks with scenic formations. 2. Display pictures of places the children have visited.	F.A., S.S.
4, 5, 6	DIFFERENT KINDS OF ROCKS ARE FOUND IN DIFFERENT PLACES. Bedrock is the parent material from which all rocks and soils are derived. It lies under the soil of the earth and can be seen in quarries, stream banks, and road cuts. 1. Collect and identify ten different rocks in our locality. 2. Send to State Geology Dept. for minerals map of State.	Sc.
4, 5, 6	OUR STATE HAS SOME PRINCIPAL COMMERCIAL MINERALS AND ROCKS. These are: sand and gravel, chromium ore, gold, nickel, mercury. This State imports from other states and countries metallic minerals like iron and aluminum used in its industries. 1. Locate on map of State the areas of principal commercial minerals. 2. List those minerals by decreasing importance to our economy. 3. List 10 minerals that our State imports and from what area.	S.S., L.A.
4, 5, 6	WEATHERING BREAKS UP ROCKS. Freezing, thawing, heating and cooling, help to break rocks into smaller pieces. Plants, such as lichens, also help break rocks into smaller pieces. 1. Put various samples of rocks in water and freeze. Thaw and freeze again several times to observe breaking down of rocks. 2. Introduce "hardness" as used for classification.	Sc.
4, 5, 6	THE SOIL IS PARTLY MADE UP OF WEATHERED ROCKS. The other part of the soil is the decayed organic material, such as plants and animals. 1. Put handful of soil into water. Agitate the water and examine how heavy rocks sink to bottom. 2. Examine soils and see difference between decayed organic material and mineral material in soils.	Sc.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
4, 5, 6	SOME ROCKS ARE USED FOR BUILDINGS AND ROAD SURFACING. 1. Identify the many kinds of rocks used for these purposes. 2. Locate areas where each type is found. Use map.	Sc., S.S.
4, 5, 6	MINERALS ARE NEEDED TO MAKE MANY THINGS. Useful products, such as automobiles and toys, are made from minerals. Our food has many minerals in it, too. 1. Write a paper explaining the different minerals that are in ten items in our schoolroom. 2. Explore what minerals are found in our classroom.	S.S., L.A.
5, 6	USEFUL MINERALS ARE DISTRIBUTED UNEVENLY THROUGHOUT THE WORLD AND VARY GREATLY IN QUANTITY AND QUALITY. The United States imports some of the minerals it needs. 1. Over half our minerals are imported. 2. List ten imported minerals and the country from which they come.	S.S., L.A., Math.
5, 6	EVERYTHING WE EAT, WEAR, OR USE HAS MINERALS IN IT. 1. Burn leaves in bowl. Pour water over ashes and mix thoroughly. Let water evaporate and observe mineral deposits in pan. 2. Test soil with litmus paper for acidity.	Sc.
5, 6	WE CAN CONSERVE OUR MINERAL RESOURCES. Some methods include: mining and processing ways that result in least waste; employing processes in which it is possible to use low-grade deposits; salvaging and re-using mineral products when possible; using renewable or plentiful substitutes for scarce or limited minerals; conserving things made from minerals by protecting against wear and corrosion, and using mineral products as long as possible. 1. Get resource person from Dept. of Geology and Mineral Industries to talk about mineral conservation. 2. Discuss thoroughly above items.	Sc., S.S., L.A.
5, 6	MINERAL DEPOSITS ARE CONTINUOUSLY BEING FORMED, BUT THE RATE IS SO SLOW THAT MAN CAN COUNT ONLY ON THOSE ALREADY DEPOSITED. MINERALS ARE EXHAUSTIBLE AND NONRENEWABLE. 1. Explore areas in which minerals have been depleted and industries have had to move to other places. 2. Discuss deposits in relation to geologic time.	Sc., S.S.

Water Concepts

1, 2, 3	WATER IS USEFUL FOR PLEASURE. Uses include fishing, boating, water skiing, swimming, or just sitting by and looking at it. 1. Lists all types of activities that take place on or in water. 2. Bring pictures for display on bulletin boards. 3. Show color of water in pictures. Write sentences and make own pictures showing beauty of water.	F.A., S.S., L.A.
1, 2, 3	WE WASTE WATER IN MANY WAYS. IF THERE IS TO BE ENOUGH WATER FOR EVERYONE, WE MUST USE IT WISELY. Polluted or dirty water is wasted because it cannot be used again. 1. Discuss over-watering. 2. Discuss the water of a near-by river being too impure to use for swimming.	S.S.
1, 2, 3	THE WATER THAT WE USE COMES FROM STREAMS, RESERVOIRS, LAKES, WELLS AND SPRINGS. It is brought to our homes by pipes and pumps. Visit a city reservoir. Discuss the other sources of water from experiences the children have had.	S.S., L.A.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
3	OUR COMMUNITY HAS MANY NEEDS FOR WATER. Some uses are for domestic purposes, industry, irrigation, waste disposal, recreation, navigation, hydroelectric power, fisheries, aquatic habitat and aesthetic enjoyment. 1. List needs we have for water. 2. Melt ice, snow and hail to make water.	S.S., L.A.
1, 2, 3	THE PRIMARY SOURCE OF PURE FRESH WATER IS RAIN, SNOW, SLEET OR HAIL. Melt ice, snow and hail to make water.	Sc.
1, 2, 3	WATER HAS SEVERAL FORMS (SOLID - ICE) (GAS - STEAM & WATER VAPOR) (LIQUID - WATER). Make steam. Catch water vapor on pane of glass.	Sc.
1, 2, 3	ALL LIFE MUST HAVE WATER. Fish and some insects, for example, live in it, other forms of life need it in varying degrees. 1. Slice top from two carrots. Place one in glass of water. Watch green top grow on one in water. 2. Place acorn in glass of water. Have control. Watch roots grow on one in water.	Sc.
1, 2, 3	CLEAN WATER IS NECESSARY FOR GOOD HEALTH. Dirty water may make you very sick; whether from bacterial or virus disease, or from poisonous chemicals. Since water may be used several times, it must be kept clean to serve its various uses. 1. Examine pond water under bioscope. 2. Run water through a clean sand filter. 3. Discuss the source of our domestic water. 4. Ask children what they would do if they had only half the water they now have.	Sc., S.S., L.A.
3	WATER IS USED BY PLANTS IN MAKING FOOD. Plants take moisture from the ground and use it in the leaves in the process of food making. Plants such as rice and cranberries grow in the water. Show that food comes from the bottom of the plant up to the blossom or leaves by putting the stem into colored water. The color shows in the blossom.	Sc.
4, 5	OUR COMMUNITY HAS MANY NEEDS FOR WATER. Water must be used again and again because there isn't enough for every purpose if it is used only once; therefore, it is necessary to avoid polluting it. Two important uses of water are waste removal and the temporary dilution of waste loads. 1. List on chart ways that water may be used in community. 2. Visit local water district or have official visit class and tell about water needs (industrial, domestic, irrigation, etc.).	S.S., L.A.
4, 5	WATER IS STORED NATURALLY. Water must also be stored for orderly use when we need it most. It is stored naturally in underground reservoirs, lakes, streams, and in the soil itself. Man has built dams of many sizes to hold the water until he needs it. 1. Visit municipal watershed. See and discuss natural man-made water storage areas. 2. Discuss how other resources effect water storage.	Sc., S.S.
4, 5, 6	WATER IS OUR MOST ABUNDANT RESOURCE. Clean, pure, forest water is abundant as rainfall, snowfall, and mountain stream flow, but we need to take care to keep it clean and pure to have it available for re-use. It is constantly being renewed, but its distribution is often not adequate to meet man's needs. 1. Delineate on world map water areas as compared to land areas. 2. Relate water abundance to water cycle, land forms, and climate.	Sc., S.S., L.A.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
4, 5, 6	WATER IS A TRANSPORTER AND CARRIER OF DISEASE AND OTHER IMPURITIES. Typhoid, intestinal flu, toxins, sediment are examples of diseases carried by water. Water can clean itself of some impurities, but treatment is needed for domestic supplies and for some industrial uses. 1. Visit water treatment plant. Discuss chlorination of water for treatment of impurities. 2. Be able to list six diseases and impurities carried by water. Relate to County health shots.	Sc., S.S.
4, 5, 6	POLLUTION IS THE PRINCIPAL WAY BY WHICH OUR WATER RESOURCE IS WASTED OR MADE UNFIT FOR USE. Pollution occurs by chemicals (nutrients, toxins, detergents, oils); physical (sediment, radioactivity, temperature); biological (disease organisms such as viruses, bacteria, algae, worms, snails, birds). Other sources of pollution include domestic wastes (sewage, garbage, kitchen & laundry); industrial (toxic materials, heat, mining, agriculture, roads, dams); fallout from smoke particles; agriculture (animal and crop wastes, farmstead drainage, pesticides); forest use ((timber harvest, recreation, gas and oil from boats, body contact from swimming); accidental spills (oils, toxic materials, nutrient materials).- - - . 1. Discuss and list principal ways water is polluted. 2. Collect and test samples of water for purity (use swimming pool test kit). 3. Discuss water pollution laws and measures needed to keep water clean.	S.S., L.A.
4, 5, 6	WATER MOVES IN A CYCLE FROM CLOUDS TO EARTH AND BACK AGAIN. THIS IS CALLED THE WATER OR HYDROLOGIC CYCLE. Water is indestructible, though it may change from liquid to solid to vapor. Water supplies are also constantly being renewed. 1. Illustrate evaporation by boiling water, and plant transpiration with a plant terrarium; measure relative humidity. 2. Discuss and construct chart showing the water cycle.	S.S., Sc., L.A.
4, 6	WATER IS USED BY PLANTS IN MAKING FOOD. Plants take moisture from the ground and use it in the leaves in the process of food making. Plants such as rice and cranberries grow in the water. 1. Show that food comes from the bottom of the plant up to the blossom or leaves by putting the stem into colored water. The color shows in the blossom. 2. Compare rates of capillary action in different kinds of soil.	Sc.
5, 6	WATER SHORTAGES OCCUR AS A RESULT OF MANY THINGS. Water shortages result from the wide variation in the supply of water from area to area, and in the concentration of human demand from place to place. Pollution by preventing re-use creates shortages. Shortages also occur from fluctuation in supply and in demand, waste, and pollution. 1. Compare shortage of water on bare ground as compared to humus covered soil. 2. Discuss ways to prevent water shortages. List causes of natural shortages.	Sc., S.S.
5, 6	MAN'S NEEDS DETERMINE OUR WATER PROBLEMS. Many of man's water problems are caused from man-caused pollution. These include domestic sewage, garbage disposal, industrial wastes of many kinds, accidental spills, erosion of denuded or disturbed soil oil washed from street or highway surfaces, mine drainage and smoke particle fallout. 1. Discuss man's increased water use over the past two decades due to increase in water using appliances and increased population.	S.S.
5, 6	SOIL, PLANT AND ANIMALS ARE INTERRELATED WITH WATER. 1. Discuss and illustrate how water affects soils by leaching humus into soil. 2. Discuss and illustrate how water affects plants by giving moisture to grow. 3. Discuss and illustrate how water affects animals by giving food and drink. 4. Discuss and illustrate how each of the above affects the water.	Sc., L.A.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
5, 6	FLOODS CAUSE DAMAGE TO NATURAL RESOURCES AND PROPERTY. 1. Discuss reasons man has settled on flood plains. 2. Relate Vanport flood in Portland, 1948, or flood in your area. 3. Make survey of flood damage in your county for any one year. Discuss reasons for flooding.	S.S., L.A.
6	WATERSHEDS DIVIDE THE SUPPLY OF WATER. CAREFUL PLANNING AND MANAGEMENT OF OUR WATERSHEDS IS NECESSARY TO MEET OUR INCREASING NEEDS. 1. Define and study term "watershed". 2. Make map of watershed we are living in. 3. Discuss the many uses and resources from any watershed. 4. While on field trip explore necessity of forest humus in storage of water resource.	Sc., S.S.
6	WATER CONSERVATION IS IMPORTANT IN EVERY COMMUNITY. It includes extending its usefulness by keeping it clean. Control of pollution is an important element of conservation. Can be summed up as culminating activity. Used as an evaluation.	S.S.

Plant Concepts

1	THERE ARE MANY KINDS OF PLANTS. 1. Have children bring seed catalogs. 2. Identify different plants in the schoolyard. 3. Display different plant specimens.	F.A., Sc., S.S.
1, 2	PLANTS SERVE MAN IN MANY WAYS. Plants give us all our food either directly or by providing food for the animals we eat. Plants provide most of the material for our shelter and plants supply much of the material for our clothing. Plants serve man by holding the soil in place and preventing rapid water runoff. 1. Look at plants about us. Make list of those we use for beauty, food, utility.	S.S., L.A.
1, 2	SOME PLANTS SHOULD BE LEFT FOR US TO ENJOY. 1. Observe local housing projects where trees have been removed and places they have not been removed. 2. Relate family outings where plants have provided shade and forms of recreation.	F.A., S.S.
1, 2, 3	PLANTS HAVE MANY INFLUENCES (MAN, ANIMALS, FIRE, DISEASE, INSECTS, WEATHER). 1. Display plants destroyed by fire, beaver, bark beetles, fungus. 2. Pictures of storm damage. 3. Vandalism by man.	Sc., S.S.
1, 2, 3	ALL ANIMAL LIFE IS DEPENDENT UPON THE EXISTENCE OF PLANTS. 1. Refer to Soil Concepts — (Food Chain)	Sc.
2, 3	PLANTS HAVE DIFFERENT NEEDS AND HABITS OF GROWTH WHICH DETERMINE WHERE THEY LIVE. Some plants such as the hemlock like to grow in the shade, the Douglas-fir needs a lot of sunlight, most oak trees grow in rocky hot dry places. 1. Compare cactus garden to wet terrarium — measure amounts of water needed by each. 2. Visit nursery to note plants under cover and those not. 3. Aquarium plants growing completely under water.	Sc., S.S., Math.

Suggested Grade Level for Teaching	Concept	Curriculum Areas of Concentration
2, 3	EACH PART OF A PLANT HAS A PARTICULAR FUNCTION. The leaves or crown manufactures food so the tree can live, the stem or trunk holds the plant upright and serves as the transportation system for supplying moisture and nutrients to the leaves, the roots anchor the plant in place and deliver the soil moisture to the transportation system. 1. Draw a picture of a tree — label parts of tree and discuss function of each. 2. Plant bean seed against glass to see parts of plant.	F.A., Sc.
3	PLANTS HELP BUILD AND HOLD THE SOIL IN PLACE. In addition to anchoring the plant stable, roots hold the soil in place, the plant leaves or canopy reduces the velocity of the raindrops and retards soil erosion. The dead leaves and limbs that fall to the forest floor decompose producing humus to cover the soil and further reduce soil erosion. 1. Illustrate how decayed material builds soil by examining compost while on field trip. 2. Refer to soil concept #5.	Sc., S.S.
3	IF WE USE AND MANAGE PLANTS CORRECTLY THEY CAN BE RENEWABLE. Plants can be harvested and replenished by us so new plants will always be available for us. Trees can be harvested for wood products and then new trees will be planted to grow a new crop. If mature seed-producing trees are left, young seedlings will grow themselves. Grass can be grazed and new grass will grow if managed properly. 1. Discuss planting trees — garden flowers. 2. Have students plant trees on schoolground if possible.	Sc., S.S.
3	PLANTS ARE THE MAJOR SOURCE OF ALL FOOD AND THE MOST IMPORTANT SOURCE OF CLOTHING, SHELTER, AND WARMTH FOR MAN. Plants are the only living things that can convert the sun's energy into life giving food. In addition to this they provide a source for our clothing and shelter. 1. Make scrapbook of pictures of clothing, shelter, fuel, and food.	S.S., L.A.
4	MANY PLANTS ARE USEFUL, SOME ARE HARMFUL. NEW USES FOR PLANTS ARE BEING DISCOVERED ALL THE TIME. Plants give us many items to make our lives more pleasant. Some plants such as poison oak or nettles can harm us. New medicine and products such as plastics, nylons, etc., are being found from plants. 1. Research — Draw pictures of harmful plants. Learn to recognize. 2. Chart new uses for plants.	F.A., S.S., L.A.
4	PLANTS ARE THE MAJOR SOURCE OF ALL FOOD AND THE MOST IMPORTANT SOURCE OF CLOTHING, SHELTER, AND WARMTH FOR MAN. Plants are the only living things that can convert the sun's energy into life giving food. In addition to this they provide a source for our clothing and shelter. 1. Make chart showing types of food, clothing materials, shelter materials, and fuel. Show which come from your area.	Sc., S.S., L.A.
4	THE INFLUENCES ON PLANTS AFFECT PLANTS IN DIFFERENT WAYS (MAN, ANIMALS, FIRE, DISEASE, INSECTS). Nine out of ten fires are still caused by man, he disfigures trees in parks and campgrounds, animals chew and disfigure trees, girdle trees; lightning fires burn many acres of forest each year; disease decays wood making it useless; insects bore into trees and disfigure the wood, girdle the growth layer, killing the tree or eat the leaves so it can't manufacture food. 1. Make a chart of influences in your area and classify. List how they affect the plant. Local project — working with County Agent to discover Pine Shoot Moth.	Sc., S.S., L.A.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
4	ABOUT 50% OF OREGON'S LAND IS IN FORESTS. 75% OF THIS IS IN PUBLIC OWNERSHIP. 1. Draw a map of your state and delineate the forest areas. Show part in public ownership by color.	F.A., Sc., S.S., L.A.
4	IT OFTEN TAKES MORE THAN A LIFETIME OF ONE PERSON TO GROW TREES FROM SEEDLINGS TO MERCHANTABLE TIMBER. A tree usually puts on one growth ring of wood a year. Douglas-fir and ponderosa pine species mature in about 80 to 120 years. The virgin timber stands are often made up of trees 500 years old. These trees are considered overmature. 1. Compare the growth of a Douglas-fir to the growth of a person by listing the ages when a tree and a person are young, mature, and old. 2. Plant seedlings or seeds of trees.	Sc., S.S., L.A., Math.
4, 5	PLANTS HELP BUILD AND HOLD THE SOIL IN PLACE. In addition to anchoring the plant stable, roots hold the soil in place, the plant's leaves or canopy reduces the velocity of the raindrops and retards soil erosion. The dead leaves and limbs that fall to the forest floor decompose producing humus to cover the soil and further reduce soil erosion. 1. Show on a field trip how plants build and hold the soil in place. 2. Write report on how the soils differ. Where plants grew and where they did not.	Sc., S.S.
4, 5, 6	ALL ANIMAL LIFE IS DEPENDENT UPON THE EXISTENCE OF PLANTS. 1. Make diagram showing food chain. Emphasize how most life is dependent upon plants.	Sc.
4, 5, 6	IF WE USE AND MANAGE PLANTS CORRECTLY THEY CAN BE RENEWABLE. Plants can be harvested and replenished by us so new plants will always be available for us. Trees can be harvested for wood products and then new trees will be planted to grow a new crop. If mature seed-producing trees are left, young seedlings will grow themselves. Grass can be grazed and new grass will grow if managed properly. 1. Illustrate how plants renew themselves if man takes care of the land. Contrast this with an explanation of why plants do not renew themselves where man does not care for the land.	Sc., S.S.
5	TREES AND TREE PRODUCTS ARE IMPORTANT TO THE ECONOMY OF THE STATE AND THE NATION. Over 50% of all the jobs in Oregon are connected in some way with the wood-using industry. The nation's economy is based on a flow of raw materials. 1. Discuss importance of the industry to your State. 2. Graph various comparisons. Example — job situation in State and Nation. (percentages)	L.A., Math.
5	THE CHARACTER OF THE SOIL AND THE CLIMATE HELPS DETERMINE THE KINDS OF PLANTS WHICH WILL GROW. Soil acidity, soil texture, slope of the land, amount of soil moisture, temperature, rainfall, aspect of slope, all effect the type of plants that can grow in a certain place. 1. Discuss and list the different soil and climatic conditions which control the maor plant life in your State. 6	Sc., S.S.
5	PLANTS GROWING TOGETHER FORM COMMUNITIES, EACH MEMBER INFLUENCING ITS NEIGHBORS. All plants need light, soil moisture, nutrients, and minerals to grow. Competition of all plants determine which plants will live and which plants will die in this struggle for survival. Hemlock, for example, can grow in rotten logs and in dense shade; Douglas-fir needs open sunlight and mineral soil to survive. 1. Field trip to forest area to observe communities. 2. Plant seeds in room planters. Vary as to size, space, etc.	Sc., S.S.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
5	PLANTS PRODUCE HUMUS. All plants germinate, live, and die sometime. When plants die they fall to the forest floor and finally decay into soil producing organic decomposed material called humus. 1. Have compost located on schoolground. 2. Refer to soil concepts. 3. Put sample of moist soil with dead leaves in jar. Children observe decomposition. Called leaf mold or humus.	Sc.
5	EACH SPECIES HAS DIFFERENT REQUIREMENTS FOR AIR, LIGHT, MINERALS, MOISTURE, AND TEMPERATURE. Plants have adapted themselves to thrive in their environment. Some trees like wet sites, some dry sites. The tropical rain forests have entirely different conditions than the temperate rain forests. 1. Chart different types of plants on a map of your state and tell how they have adapted to their environment. 2. Discuss difference of tolerant and intolerant plants.	F.A., Sc., S.S., L.A.
5	PLANTS HAVE PLAYED AN IMPORTANT PART IN OUR HISTORY AND THE DEVELOPMENT OF OUR COUNTRY. Trees were often a nuisance to the pioneers, grasslands provided a resource for vast herds of cattle and sheep. 1. Compare plants of prairie, mountain, and seacoast areas of our country and show how each contributed to the settlement of the area.	Sc., S.S.
5	ABOUT 1/4 OF THE UNITED STATES IS NOW FORESTED AS COMPARED WITH 2/5 AT THE TIME OF SETTLEMENT. Because of an expanding population, needing living space and other commodities, forest land is being developed for other uses. 1. Discuss why there is less forested land now than in past and relate to concept above.	S.S.
5, 6	PLANT COMMUNITIES RESPOND TO TREATMENT BY MAN IN A FAIRLY PREDICTABLE MANNER. Douglas-fir, for example, needs mineral soil and sunlight in order to germinate and grow. By harvesting this species in clearcut harvest units, we can predict that Douglas-fir will reforest itself on the area. Hemlock on the other hand, usually needs shade to thrive. 1. Compare plant communities on well-managed land with unmanaged land. 2. Field trip to above areas.	Sc., S.S.
5, 6	PLANTS INFLUENCE EACH OTHER AND ALSO THEIR ENVIRONMENT BY COMPETITION FOR LIGHT, MINERALS, AND MOISTURE. There is only so much soil moisture available for plant growth. The plants that can utilize this moisture best and first will be the dominant or strongest trees. 1. See above field trip.	S.S.
6	DOMESTIC PLANTS ORIGINATE FROM NATURAL SPECIES BY SELECTION AND EXPERIMENTATION. All of our domestic plants were once natural wild species. 1. Discuss and list domestic plants and their ancestors. 2. Plant wild plants to note changes under cultivation. 3. Discuss hazelnut and filbert — maize corn.	Sc., S.S., L.A.
6	IN DEVELOPING OUR NATION SOME OF OUR ORIGINAL FOREST LAND HAS BEEN REMOVED. MUCH OF THE REMAINING FOREST IS ON THE MORE MOUNTAINOUS AND LEAST PRODUCTIVE LAND NOT SUITABLE FOR AGRICULTURE. 1. Show pictures. 2. Field trip to forest — Have pupils relate observations.	F.A., Sc., S.S.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
6	THE PRINCIPAL FACTORS REDUCING FOREST PRODUCTION ARE POOR CUTTING PRACTICES, INSECTS, DISEASE, AND FIRE. THE PRINCIPAL FACTOR REDUCING GRASSLAND PRODUCTION IS OVERGRAZING. 1. Design posters for fire prevention. 2. Discuss first how these factors effect forest production. 3. Classify and identify six major harmful insects in the Northwest.	F.A., Sc., S.S., L.A.
6	CULTURE THROUGHOUT THE WORLD IS INFLUENCED BY THE KINDS OF PLANTS AN AREA CAN GROW. FORESTS, NATIVE GRASSLANDS, AND CULTIVATED CROPS OF MANY KINDS ARE THE PLANTS OF MOST IMPORTANCE IN THE WORLD. 1. Trace the history of the development of areas in South America. (Pampa, Rain forest, etc.).	S.S.

Animal Concepts

1, 2, 3	THERE ARE MANY DIFFERENT KINDS OF ANIMALS. Some are so tiny we cannot see them without a microscope. Others are identifiable as invertebrates, worms, insects, amphibians, reptiles, fish, birds, and mammals. 1. Field trip to zoo. 2. Pictures of different kinds for bulletin board. 3. Bird calendar made with pictures giving dates when observed.	S.S.
1, 2, 3	ALL ANIMALS MUST HAVE FOOD, WATER, AND SHELTER. Each different kind needs different foods and different kinds of shelter. Some live in water; others absorb it or drink it. Each animal must have sufficient, food, water, and shelter throughout the year. 1. Have pet in the room and observe its specific living requirements. 2. Adopt animal — Check its requirements — build model of the animal — build model home.	Sc., S.S.
1, 2, 3	SOME ANIMALS ARE TAME OR DOMESTICATED AND CAN LIVE WITH OR CLOSE TO PEOPLE. OTHER ANIMALS ARE WILD AND CAN LIVE ONLY IN PLACES WHERE PEOPLE AND HOUSES ARE NOT CLOSE. WILD ANIMALS SUCH AS INSECTS MAY LIVE CLOSE TO PEOPLE. Man has changed the environments. This sometimes has forced animals to move from good habitat to some which is less desirable. 1. Discuss and list pets. 2. Discuss and list wild animals. 3. Discuss and list domesticated farm animals.	Sc., L.A.
1, 2, 3	ALL ANIMALS ARE IMPORTANT TO MAN OR TO OTHER ANIMALS. SOME ARE USEFUL TO MAN IN HIS WORK; OTHERS PROVIDE FOOD AND CLOTHING. SOME ANIMALS ARE IMPORTANT BECAUSE OF THE DAMAGE THEY DO. WILD ANIMALS PROVIDE HUNTING, FISHING, AND OTHER TYPES OF RECREATION. Man uses horses for pulling loads or carrying. He kills pigs, cows, sheep, chickens, and other animals for food. He must sometimes destroy skunks, raccoons, and weasels which raid his poultry yard. Deer, elk, pheasants, and others provide recreation. 1. Make scrapbook of animals which help man. Those which do damage. 2. Show and tell — Hunting and fishing episodes. 3. Observe articles of clothing made from fur and animal hides.	S.S.
1, 2, 3	SOME ANIMALS EAT LEAVES, FRUITS, SEEDS, OR NUTS PRODUCED BY PLANTS WHICH LIVE ON LAND OR IN THE WATER. OTHER ANIMALS EAT MEAT WHICH THEY OBTAIN BY KILLING OTHER ANIMALS. SOME ANIMALS EAT BOTH. 1. List food necessary for different kinds of animals.	Sc., S.S.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
2, 3	ANIMALS HAVE DIFFERENT NEEDS AND HABITS WHICH DETERMINE THE PLACES WHERE THEY LIVE. ANIMALS ARE PART OF THE COMMUNITIES OF LIVING THINGS. Most animals establish a "home range" which is the area in which they raise and feed their families, and live out their entire life. 1. Have bird nest in room — Discuss characteristics of materials, shape, size, etc. Explain how nests are designed to protect small birds from weather, predators, gravity.	Sc., S.S.
3	WILDLIFE IS FOUND EVERYWHERE; SCHOOLGROUNDS, YARDS, PARKS, FARMS, FIELDS, FORESTS, ARID LANDS, SWAMPS, STREAMS, LAKES, AND OCEANS. See how many different kinds of animals you can find in one small area of your school yard. 1. Post pictures they draw of animals inhabiting each environment. (Mural)	F.A., S.S.
3	SOME ANIMALS HAVE BECOME EXTINCT BECAUSE OF MAN'S EXPLOITATION. OTHER ANIMALS MAY BE IN DANGER. Example: Koala bear Egret Trumpeter Swan	F.A., S.S.
4	ALL ANIMALS ARE IMPORTANT TO MAN OR TO OTHER ANIMALS. SOME ARE USEFUL TO MAN IN HIS WORK; OTHERS PROVIDE FOOD. SOME ANIMALS ARE IMPORTANT BECAUSE OF THE DAMAGE THEY DO. WILD ANIMALS PROVIDE HUNTING, FISHING, AND OTHER TYPES OF RECREATION. 1. Relate to animals in your area. 2. See primary grade concepts.	Sc., S.S.
4	ANIMALS HAVE DIFFERENT NEEDS AND HABITS WHICH DETERMINE THE PLACES WHERE THEY LIVE. ANIMALS ARE PART OF THE COMMUNITIES OF LIVING THINGS. 1. Discuss and list way in which animals of similar habitats are alike. (Deer, elk) 2. Discuss how animals have changed their habitats successfully.	Sc., S.S., L.A.
4, 5, 6	WILDLIFE IS FOUND EVERYWHERE; SCHOOLGROUNDS, YARDS, PARKS, FARMS, FIELDS, FORESTS, ARID LANDS, SWAMPS, STREAMS, LAKES, AND OCEANS. 1. List types of wildlife found on schoolground and at home. 2. Examine wildlife in 1 sq. ft. of ground.	Sc., S.S., L.A.
4, 5, 6	ANIMALS ARE CREATURES OF HABIT, USUALLY SPENDING THEIR ENTIRE LIFE WITHIN A SPECIFIC AREA KNOWN AS A "HOME RANGE." Within this area each inhabitant must find sufficient food, water, and shelter. The "home range" is defended against intruders. 1. Map an area of your state. Locate herd areas and patterns of migration.	S.S.
4, 5, 6	ANIMALS USUALLY PRODUCE FAR MORE YOUNG THAN THE ENVIRONMENT CAN SUPPORT. This is "mother nature's" way of insuring the survival of each species. Starvation, disease parasites, predators, accidents, natural deaths, and man help to reduce the numbers. 1. Use aquariums and guppies to observe how quickly an environment can become overstocked. What happens to the fish? Might they be slower or weaker? What happens if man helps protect the young? Do the fish multiply faster? Does the killing of one type of wildlife bring about an unbalance in an environment?	Sc., S.S.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
4, 5, 6	WILDLIFE CAN LIVE AND PROSPER ONLY IN AN ENVIRONMENT WHICH PROVIDES ADEQUATE AMOUNTS OF FOOD, WATER, AND SHELTER IN EVERY SEASON OF THE YEAR. Food is frequently not as plentiful in winter as in summer. Food requirements for different kinds of animals differ. Water must be available close to both food and shelter. Shelter will be of several different kinds. 1. Write your Fish & Game Department for information on how yearly limits are determined. 2. Get copies of game and fishing laws. 3. Why do some lakes need to be poisoned?	S.S., L.A.
4, 5, 6	WILDLIFE POPULATIONS ARE LIMITED BY: 1. LACK OF FOOD, WATER, OR SHELTER (SUITABLE HABITAT) 2. DISEASE 3. PREDATION 4. ACCIDENTS 5. HARVESTING BY MAN (HUNTING & FISHING) 1. Discuss and list ways that above items limit the wildlife population.	S.S., L.A.
4, 5, 6	ANIMALS ARE OFTEN INCAPABLE OF ADAPTING TO CHANGES IN THEIR HABITAT, BUT SOME ANIMALS CAN TOLERATE A WIDE RANGE OF ENVIRONMENTAL CONDITIONS AND MAY THRIVE AS A RESULT OF CHANGE. Bison disappeared from the grass ranges when the prairies were plowed. Pheasants thrive in areas where grains are produced. Raccoons have adjusted to civilization and man. 1. Discuss species which have adapted to their environment (deer) as opposed to those which have not been able to adapt. (Dinosaur, etc.).	Sc., S.S.
5, 6	THE SURPLUS MUST BE REMOVED NATURALLY OR BY MAN IF THE ENVIRONMENT IS TO BE MAINTAINED AND ANIMAL LIFE TO SURVIVE. If undisturbed, nature maintains a fairly good balance between numbers of animals and their food supply. By recreational hunting and fishing man can harvest surpluses to keep them from being removed by nature. 1. Refer to concept above on how limits are established. 2. Discuss how animals are limited in number due to their environment. Show that excess will die. Therefore, it is better for man to harvest and use this surplus. The decaying dead animals can infect the healthy animals.	Sc., S.S., L.A., Math.
5, 6	MANAGEMENT OF WILDLIFE POPULATIONS MUST BE APPLIED IF WE ARE TO CONTINUE TO ENJOY THE BENEFITS WHICH WE NOW RECEIVE FROM THE ANIMALS ABOUT US. This includes the regulated harvest of surpluses, and also the improvement of habitat. 1. Draw pictures or write stories showing examples of management practices. 2. Give report on Passenger Pigeon. 3. Report on animals which are extinct or nearly so.	F.A., Sc., S.S., L.A.
5, 6	MANAGEMENT IS AN ATTEMPT BY MAN TO BRING ABOUT A BALANCE BETWEEN NUMBERS AND THE CAPACITY OF THE ENVIRONMENT TO SUPPORT THEM. AMOUNT OF FOOD, WATER, SHELTER — ANIMAL POPULATIONS MANAGEMENT 1. Discuss how man has upset the balance and how the harvesting of the surplus is essential. Some animals are moved to a new location where they are needed. (Beaver)	Sc., S.S.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
5, 6	SCIENTIFIC MANAGEMENT OF WILDLIFE RESOURCES IS BASED UPON FACTUAL INFORMATION CONCERNING ALL FORMS OF WILDLIFE, THEIR INTERRELATIONSHIPS WITH THE ENVIRONMENT AND WITH OTHER ANIMALS. Biologists gather scientific facts about wildlife resources which can be used in management. Other individuals contribute information. Resource management agencies for soil, water, minerals, and plant life also provide information and point out problems. Citizens should try to learn about such problems to determine which possible solutions are best. 1. Discuss what the job of Wildlife Management personnel necessitates. 2. Use resource persons.	S.S., L.A.

Recreation Concepts

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
1, 2	MANY BIRDS AND ANIMALS ARE HELPFUL TO MAN AND SHOULD BE ATTRACTED AND PROTECTED BY MAN. They help keep insects and destructive animals in check. 1. Mobiles of birds or animals. 2. Bird houses. 3. List ways that birds and animals are helpful to man.	F.A., S.S., L.A.
1, 2, 3	THE BEST WAY TO ENJOY NATURE IS TO OBSERVE NATURE. 1. Take a nature walk. Chart stories and pictures. 2. Adopt a tree and make experience chart during the different seasons.	Sc., S.S.
1, 2, 3	GOOD HABITS IN THE USE OF OUTDOOR RECREATIONAL AREAS ARE IMPORTANT. FOR EXAMPLE: WILDFLOWERS SHOULD BE LEFT FOR OTHERS TO ENJOY. 1. From pictures learn the names of wild flowers. 2. Collect wild flowers (press). 3. Use Richfield wild flowers seeds.	Sc.
1, 2, 3	WE SHOULD NOT HARM OUR FORESTS BY LITTERING, VANDALISM, OR WRONG USE OF FIRE. 1. Smokey The Bear — songs, pictures, dramatizations. 2. Children draw pictures of litter prevention. Place in hall, cafeteria, etc. 3. Pick up litter on a field trip and display in show case. 4. Make a "litterbug" from litter and display.	F.A., Sc., S.S.
1, 2, 3	WE CAN IMPROVE THE BEAUTY OF OUR HOME AND SCHOOLYARD BY TAKING CARE OF OUR TREES AND SHRUBS. 1. Class project of planting a small area and caring for it throughout the year. Landscaping around buildings. 2. Help younger brothers and sisters learn not to trample flowers and to respect people's property.	F.A., S.S.
1, 2, 3	WE SHOULD WEAR THE PROPER CLOTHING SO WE CAN PLAY SAFELY AND HEALTHFULLY OUTSIDE. 1. Posters showing proper clothing. 2. Emphasize proper clothing for different seasons.	F.A., S.S., L.A.
2, 3	THERE ARE MANY KINDS OF FOREST RECREATION FOR PEOPLE TO ENJOY. These include picnicking, camping, hiking, swimming, skiing, boating, fishing, hunting, and just looking at the scenery. 1. Parks, lakes, trail hiking, camping. 2. List all the types students have done with their family.	S.S.

Suggested Grade Level for Teaching	*Concept*	*Curriculum Areas of Concentration*
4	THERE ARE MANY DIFFERENT KINDS OF RECREATIONAL OPPORTUNITIES IN THE STATE. These include picnicking, camping, hiking, swimming, skiing, boating, fishing, hunting, and just looking at the scenery. 1. List and discuss different kinds of recreational opportunities in the Northwest. 2. Relate places they have visited of special interest to them. Bulletin board of postcards, etc.	F.A., S.S., L.A.
4, 5, 6	WE SHOULD WEAR THE PROPER CLOTHING SO WE CAN PLAY SAFELY AND HEALTHFULLY OUTSIDE. 1. Discuss special clothing needed for various sports and activities.	S.S.
4, 5, 6	WE CAN LEARN TO SHARE AND LIVE WITH EACH OTHER OUT-OF-DOORS. HABITS OF COURTESY, SAFETY, AND SANITATION ARE ESSENTIAL IN OUTDOOR LIVING. THE OUT-OF-DOORS CAN BE A SOURCE OF ENJOYMENT AND A FACTOR IN HEALTHFUL LIVING. 1. Relate sportsmanship rules at school with outdoor camping responsibilities. 2. Sanitation, water pollution. 3. Stress personal pride in self and environment.	Sc., S.S.
4, 5, 6	WE CAN IMPROVE THE BEAUTY OF OUR HOME AND SCHOOLYARD BY TAKING CARE OF OUR TREES, SHRUBS, AND GROUNDS. 1. Planting projects at home and at school. 2. Help custodian care for grounds. 3. Litter patrols.	Sc., S.S.
4, 5, 6	THE USE OF SCHOOL FORESTS AND OUTDOOR SCHOOLS IS AN IMPORTANT PART OF OUR EDUCATIONAL PROGRAM. 1. Field trip to forest areas or participate in other districts' outdoor schools. 2. See and discuss areas which cannot be covered in classroom.	F.A., Sc., S.S., L.A., Math.
4, 5, 6	THERE ARE MANY RECREATION AREAS CONSTRUCTED AND MANAGED BY MAN ON PRIVATE, STATE, AND FEDERAL LANDS. 1. Map federal, state, and private lands used for recreation. Contact organizations concerned. 2. List types of recreation and area.	F.A., S.S., L.A.
6	WILDLIFE IS IMPORTANT FOR FOOD AND RECREATION ACTIVITIES. 1. Refer to appropriate wildlife concept.	S.S.
6	AN OUTDOOR AREA WHICH IS TO BE USED FOR RECREATIONAL OR EDUCATIONAL PURPOSES SHOULD BE SAFE AND SANITARY. 1. Should have fire protection — should be careful where we place toilet facilities. 2. Relate from personal experience where these things were placed. (How far from streams? Why fireplaces, etc.?)	S.S., L.A.
6	A SCHOOL ARBORETUM CAN HELP US LEARN AND APPRECIATE THE DIFFERENT TREES AND ADD BEAUTY TO OUR SCHOOL. 1. Develop a school arboretum.	Sc.

Conservation Concepts for Grades 7 - 12

JUNIOR HIGH GRADES (7 - 8 - 9)

Objectives: Learn about the application of management and the effect of resources on society. To further the development of the appreciation of our natural resources and their use.

SENIOR HIGH GRADES (10 - 11 - 12)

Objectives: Learn about the application of management and the effect of resources on society. To further the development of the appreciation of our natural resources and their use.

General

Suggested Grade Level for Teaching	*Concept*
7, 8	Nature sustains all the natural resources on a cooperative basis. Some of these resources are renewable unless the balance of nature is upset.
7, 8	Man's demands upon natural resources increase as populations grow and as we industrialize more and more. People must have natural resources for food, clothing, shelter, water, tools, energy, space, opportunity for gainful employment, wholesome recreation, and avenues for satisfying esthetic experiences.
7, 8	Despite his intelligence and his remarkable knowledge and technology, man is subject to the same natural laws that control or affect the welfare of all animals. Conservation implies: (a) man's knowledge of these laws (b) practices which apply this knowledge
7, 8	Seventy-five percent of the forest land in the United States is in small private ownership (400 acres or less). Under good forest land management practices small forest land ownerships can produce an income within a short span of years.
7, 8, 9	Man depends upon the total body of natural resources to supply his needs and he must use land, labor and capital in order to develop resources into usable products.
8, 9	Through such programs as TVA, the President's Water Resources Policy Commission, and Rural Area Development, the government seeks to promote resource conservation.
9	Man has as yet relatively little understanding of the effects of the changes he makes in the physical environment upon the productivity and duration of needed natural resources.
10	Conservation is a world-wide problem requiring peaceful cooperation among nations. Natural resources affect not only the material welfare of a culture but also, either directly or indirectly, philosophy, religion, government, and the arts. Cultural changes may affect the importance of different resources.
10, 11, 12	As citizens, individuals have a responsibility for supporting policies which promote the wise use of resources and for electing officials who will work for this objective.
10, 11, 12	Forests are living communities. Since they are living they are ever changing. Therefore, nothing in the forest can be preserved. Areas set aside to be "preserved" can only be managed to maintain the present resources to a certain degree.
11, 12	Conservation laws in a democracy are a means by which the majority tries to ensure that a careless and selfish few do not impair resources for all. In any society, concern for, and understanding of the conservation of natural resources on the part of the general public is basic to the broad application of conservation.
11, 12	Conservation is not only a responsibility of individuals, but it is also a field for broad social action and collective responsibility of people through government because: (a) the span of time between investment in conservation effort and the return from it may often seem too long to satisfy the needs of individuals. (b) conservation practices applied in one place may benefit other people and places.

Suggested Grade Level for Teaching	*Concept*
11, 12	Many forest lands are managed under the "Multiple Use" concept of forest land management. The objectives are: (a) establishing a pattern of land use and resource development that conforms with changing conditions and public needs. (b) managing each area for as many purposes as are feasible and desirable. (c) integrating management activities so that each contributed to the others for optimum efficiency and public benefit.
11, 12	Our economy is based on the supply of natural resources.
11, 12	As demand and competition for all forest resources grows and as more people demand natural resource products and services on forest lands, all public and private land managers must manage and integrate the renewable resource production at a capacity without impairment to the soil and other resources in order to supply and meet these demands.
12	There are sincere and fundamental differences of opinion regarding government's proper role in the management of our natural resources.
Soil	
7	Most soils have three layers or horizons. They are top soil, subsoil and parent material.
7, 8	There is a direct relationship between soils and plants, soils and water, soils and wildlife, soils and man.
7, 8	Soils used according to their capability and treated in relation to their needs will provide food, water, recreation, wildlife and timber for all generations.
7, 8, 9	Soil erosion has changed the lives of people of many nations and of people in our own nation.
8	Soil depletion affects the nutritional value and growth of plants in the soil.
8, 9	Plant and animal life exist in the soil, help form it and change the structure and nature of the soil.
8, 9	Land is classified into 8 classes according to its capability for cultivated crops and suitability for timber, recreation, water, wildlife, and forage.
9	The depletion of the organic matter in the soil is the first step to soil erosion.
9	Soils vary in their ability to produce crops and withstand intensive use.
10	Fertility of the soil is maintained or increased by increasing the availability of elements needed by plants and the physical properties of the soil, i.e., structure, porosity, etc.
10	The steeper the slope of the land, the more intensive the measures must be for controlling erosion.
10, 11, 12	Soil conservation practices are necessary if we are to use and still conserve our soils.
10, 11, 12	Our Government and private landowners are working to conserve our soils.
10, 11, 12	Soil depletion affects the economic well-being as well as the health of the farmer, the community, and our country.
10, 11, 12	Land use management plans are an important tool to proper land use management.
10, 11	Maintaining soil structure also helps control erosion. Excess water is harmful to crop production.
12	Population increases require better use of our soils and a greater need for soil classification through soil surveys.
Minerals	
7	Rocks are divided into three major groups: igneous, sedimentary and metamorphic.
7	The three general classes of mineral deposits are: metallic, nonmetallic and fuels.

Suggested Grade Level for Teaching	*Concept*
8	Most metallic minerals are compounds which have to be chemically broken down to extract the metal. Location of certain mineral industries is influenced by availability of mineral resources.
8	Scientific advancement through research is probably the most important conservation technique in mineral conservation.
8	Available deposits of minerals, coal, oil, etc., are exhaustible.
9	Minerals weathered from rocks are the main constituents of soils.
9	New mineral uses often bring about cultural changes.
10, 11, 12	International affairs are influenced to a large degree by the availability of minerals.
10, 11, 12	Fossil fuels supply over 90% of the energy we expend to produce products.
10, 11, 12	Mineral conservation includes all the means by which mineral supplies will serve more people for a longer time.
12	The sun, wind, tides, and atom supply unlimited amounts of energy that may be used for mechanized power.
12	Continued research is finding new sources of minerals and more efficient extraction methods to develop mineral substitutes.
12	The United States imports many vital raw materials from other countries.
12	Mineral resources can be conserved through utilizing improved mining methods, employing methods in which it is possible to use low grade deposits, using renewable or plentiful substitutes for unlimited minerals and by conserving, salvaging, and re-using mineral products whenever possible.
12	Some practices for mineral conservation must be imposed through law because a desire for private financial gain may result in wasteful exploitation of mineral resources and mineral deposits frequently cut across property lines.
12	As the United States continues to use its resource supplies at the present rate, many of our known supplies may be exhausted in the foreseeable future.

Water

7	Water is necessary in all our activities, e.g., our bodies are 70% water.
7, 8	The water cycle produces a continuous supply of water (97% in oceans, only 3% fresh water including glaciers, streams, lakes, ground water).
8	Watersheds divide the land area drained by river systems. Drainage basins are synonyms for watersheds.
8	Water is needed by all plants and animals (including fish). It requires from 300-800 lbs. of water to produce a pound of plant material.
8, 9	Every community needs a good water supply. One person uses an average of 150 gallons a day.
9	Some water has high mineral content. Municipal water should not exceed 100 parts of calcium, magnesium or other salts per million parts of water.
9	Water pollution is everyone's concern. It costs more to remove pollution than to prevent it.
10	Water pollution is everyone's concern. It costs more to remove pollution than to prevent it.
10, 11	Careful planning and development of our watersheds is necessary to meet our ever expanding needs. Most cities plan systems so that they are 10 years ahead of demand for water.

Suggested Grade Level for Teaching	*Concept*
11, 12	To insure the most efficient use of our water resources a multi-purpose water resource program must be developed. Many large reservoirs and lakes supply water for cities, recreation, irrigation, industry and power.
12	There are Federal, State and local conservation agencies concerned with the water resources problem. Typical are: Dept. of Interior, Dept. of Agriculture, Federal Power Commission, Corps of Engineers, State and local water resources boards.
12	There is often a conflict of interest in the way water is managed.
12	Water conservation includes measures to increase the supply, improve drainage, reduce waste, protect watersheds, prevent pollution, control floods, develop storage facilities, provide recreation and transportation, and to insure the water needs of our future generations.
12	Broad regional committees such as the Columbia Basin Interagency Committee are necessary to insure long range planning of water sources and needs.
12	Water supply and water quality management are inseparable parts of water resource development.

Plants

7	Plants carry on transpiration and tend to reduce direct evaporation from the soil.
7	Plants convert the enormous energy of the sun into many useful products for man.
7	Forest plants help protect watersheds, regulate stream flow, prevent stream pollution and silting.
8	The soil and climate of our state will grow a variety of plants. We produce over 50 agricultural crops in addition to forest products.
9	All plants are listed in a system of classification.
9	Culture throughout the world is influenced by the kinds of plants an area can grow and how man manages them. Forests, native grasslands and cultivated crops of many kinds are the plants of most importance in the world. The strongest nations in the world grow most of their needed plant materials or have easy access to them. America's need for forest products is increasing.
9	Through plant breeding and selection, more desirable plants are being developed. The thousands of kinds of plants which occur in nature may be the source of new medicines or new crops important to man. Continued study and research of plants is important to man's welfare.
10	Our state is .... forested. It has .. principal forest regions, ...
10, 11, 12	Professionally trained resource people are needed to manage many of the forests and woodlands.
11	With proper management, the productiveness and the value of plant crops can be increased.
11	Full production of all timber producing lands are necessary to insure enough wood products for a growing nation. Harvest of timber on forest lands must be planned so that other renewable resources present are not impaired.
11, 12	The proper management and harvest of forage from grasslands is essential to insure grass production for grazing livestock and not impair the other resources.
11, 12	The production of wood products is the number one resource industry in some states.
11, 12	Governmental agencies provide technical assistance and financial aid to many State and private forest landowners in the development of their management programs.

Suggested Grade Level for Teaching	*Concept*
11, 12	Areas of different plant and vegetative types are managed as natural areas, with no man-caused disturbance for scientific research and study.
12	Effects of forest influences on a forest can alter man's plan for management. A timber management plan must be made in order to efficiently harvest, replenish and grow a new crop on timber producing land. This involves an inventory of timber types, species, volume, growth, productivity, age, condition of the forest.
12	Different timber species are harvested by different silvicultural and economic methods and practices.
12	Timber is harvested on a "sustained yield" basis over a certain "rotation". The volume of timber harvested equals the volume of timber that grows each year over a certain period of time, this is known as annual allowable cut in thousand board feet.
12	Plants have many values. Some plants may be worth so much for esthetic values that no dollar value can be assigned. The importance of plants to water storage and runoff is indefinable. Much of our economy is based on plants and their products, and without plants we could not survive on earth.
Animals	
7, 8	All living things must live together according to nature's laws. There is an ecological relationship between plants, animals, soils and water.
7, 8	There is an interdependence between plants and animals.
8	Although there are many habitat arrangements all must satisfy the fundamental needs — food, cover, water and living space.
8, 9	Food, cover, water and living space add up to what is called "carrying capacity." This is the number of animals a certain area can support or carry at a given time.
9	Every piece of land, no matter how large, has a definite limit to its capacity to provide food, water, shelter, and living space to animals.
9	Wildlife conservation is the application of basic principles and practices of management so that annual crops of wildlife surpluses can be harvested by man in a systematic, orderly fashion.
9	Everything man does to the land changes the ability of the land to support wildlife.
10	Food, cover, water and living space add up to what is called "carrying capacity". This is the number of animals a certain area can support or carry at a given time.
10	Every piece of land, no matter how large, has a definite limit to its capacity to provide food, water, shelter, and living space to animals.
10	Wildlife conservation is the application of basic principles and practices of management so that annual crops of wildlife surpluses can be harvested by man in a systematic, orderly fashion.
10	Everything man does to the land changes the ability of the land to support wildlife.
11	Good conservation practices applied to soil, water, and plants will usually result in improved habitat for wildlife and fish.
11	The regulated harvest of wildlife by recreational hunting and fishing is man's way of removing surpluses which would otherwise be removed naturally. This is the application of the "wise-use" concept of conservation.
11, 12	Wildlife management is the attempt to bring about a balance between the numbers of animals and the amount of food, water, and shelter.

Suggested Grade Level for Teaching	*Concept*
11, 12	Man is the upsetting factor in maintaining the natural balance — by exploitation of certain resources, making changes in land use, greed, carelessness, apathy, waste, etc.
11, 12	There are federal and state laws pertaining to conservation of wildlife. Many private and public agencies have programs concerned with the study, management and use of this resource.
Recreation	
7	There is adventure in forest recreation.
7	Recreation experiences can achieve a more balanced living.
7, 8	Much inspiration and enjoyment can be experienced in the natural beauty of our forests.
7, 8	Water is a great recreational attraction.
7, 8, 9	Vandalism and carelessness destroy thousands of dollars of recreational facilities each year.
8	Recreation affords different levels of outdoor experience. Included are camping, swimming, hiking, wilderness and esthetic or spiritual experiences.
9	Fishing and hunting regulations are necessary to insure recreational hunting and fishing for everyone.
9	Some parks and recreational areas are left in their natural state for our spiritual, esthetic and emotional enjoyment.
9	Highway scenic strips enhance our state's beauty.
9	Heavy recreation use causes land management problems.
10	Recreation is a land use. It uses all the natural resources to enhance its activities.
10	One must be prepared to live outdoors to enjoy nature.
10	Small landowners can receive income by the development of recreational uses on their land.
11, 12	Local, State, and Federal governments provide forest recreation areas and parks so that people may enjoy their forests safely.
11, 12	Recreation is the third largest industry in our state.
11, 12	Recreation use is causing the greatest use impact on America's forest land today.
11, 12	Recreational activities and businesses mean jobs for many people.
12	Improper use of recreational areas costs the taxpayer money.
12	Developed recreation areas are surveyed, planned and constructed to achieve the highest recreation experience.
12	Wilderness areas managed for a single use or purpose are a logical and integral part of the "Multiple Use" concept of forest land management. These areas are best designated and used for this aspect of resource use.

5 - SUGGESTED CLASSROOM APPROACHES AND PRESENTATIONS

The teacher or resource person actively engaged in conservation and outdoor education programs will find himself in both indoor and outdoor classroom situations. Teaching methods and their relative effectiveness are: (listed by importance)

1. Outdoor activities (field trips)
2. Classroom presentation by resource person in uniform (children are impressed with authority)
3. Visual aids
   a. movies (color preferably)
   b. slides (color preferably)
   c. opaque projector
   d. pictures — charts
   e. graphs
   f. blackboard diagramming
4. Text book (needed for guidance to study in depth)
5. Supplementary material (handouts, etc.)

INDOOR CLASSROOM

Control of students (to gain and maintain attention) is easier in the classroom than the outdoors because distractions are at a minimum, the presentation should be interesting, fast moving, and with good visual aids.

The use of attention-getters which tie into the subject matter will help put the audience into the proper attitude.

OUTDOOR CLASSROOM

In the field, students rely on all sensory perceptions to learn. The natural laboratory will help to carry the subject because of the students interest in nature. However, distractions are more prevalent, and the presentation must remain flexible enough to allow for this. For example, small animals such as chipmunks, skunks or rabbits, may appear during a tree identification course. In these cases it is usually well to divert the talk to tie in with the interruption.

HINTS TO SUCCESSFUL CLASSROOM PRESENTATIONS

Here is a list of some things for the resource person and teacher to consider when preparing or giving a presentation to a group of students. Probably the most important is the talk with the teacher before your presentation. If you can relate some of your talk to what the class has been studying it will be more meaningful.

1. If you are a resource person wear your uniform.
2. Have conference with teacher prior to presentation and settle questions such as:
   a. How do I fit into your program on conservation?
   b. What have you been studying on conservation?
   c. What subject matter do you want me to talk about?
   d. Will you handle attention of class or do I?
   e. How much technical terminology can the children understand?
3. Use some good attention getters or gimmicks.
4. Get class involvement to stimulate thinking and participation.
5. Don't try to cover too much subject matter in time allowed. It might be best, for example, to stress one or two concepts from the Conservation Scope & Sequence Chart.

6. Some repetition of important resource points is a good learning technique.
7. Remain standing to keep attention — don't sit down during presentation.
8. Summarize the main point of talk at conclusion.
9. Try to show audience that what you have to say affects them as individuals.
10. The amount of personal identity needed depends on the group, subject matter of discussion, etc. At teacher workshops, for example, we are discussing resource interrelationships and not so much agency management or operation.
11. Teach through discovery when possible (ask questions and lead them to the answer through other questions).
12. Make students decide or select a choice — children learn through mistakes.
13. Active learning takes place through participation.
14. Supply the answer as last resort.
15. Keep to subject.
16. Know what concept you're teaching.
17. Demand attention by not talking when others are talking.
18. Use firm (but not harsh) voice.
19. When on field trip involve class in:
    a. Seeing
    b. Smelling
    c. Tasting
    d. Feeling
    e. Hearing

ATTENTION GETTERS

Here are some attention getters to start a presentation:

1. 70% of your body is water. (Statements such as this can make a talk on water more important to an individual student.)
2. How does my talk affect taking your girl out on Saturday night? (Resources provide jobs which provide money which I need to spend)
3. Draw 5-pointed star on blackboard — hang one of the renewable resources on each point and label the inside "soil".
4. How many houses can be built with each year's allowable timber cut?
5. How far will each year's allowable timber cut stretch if sawed into 2x4's and stacked end to end? How long a boardwalk would it build?
6. Ask for audience response to three key words, such as Forest Ranger, city, Smokey Bear. Answers might be trees, buildings, and fire. A talk would then be patterned around the necessity of keeping wildfire out of woods so that there will be adequate lumber for buildings. Obviously key words should be selected that will have a standard response or the speaker may find himself making an impromptu talk. (Primary and intermediate grades)
7. As each major resource is discussed, a landscape picture of it can be drawn on the blackboard until at the conclusion the picture represents a forest scene with all the appropriate uses. (Good for primary grades)
8. Same as above except major emphasis would be how the various uses or resources affect each other.
9. Do you know the difference between the Forest Service and the Park Service?
10. Put words on blackboard — "resource" and "management" — and tie talk to these words.
11. How many pounds of food does it take to make a fish? (A 10 -lb. bass eats enough sunfish, etc., which eat enough plant food to make *14 tons* of food.)
12. Hold a leaf in front of class and have them list everything they know about a

leaf and its function in relationship to the tree to other resources and to man.

13. Do you realize that the clothes you are wearing might be made from a wood product? Do you know that the paper you write on, the books you read, and the frames on your glasses are made from wood? Do you know that plastic screwdriver handles, turpentine, rosin, some kinds of glues, vanilla flavoring, and maple syrup are all derived from wood products? (Good for primary and intermediate grades)

14. Build a box to resemble a log section. In discussing forest products pull a sample of each item to be discussed from the box as the talk progresses. (Primary and intermediate grades)

15. Build or draw a pendulum which swings between "preservation" and "over exploitation". The pendulum can swing back and forth but will find its point of balance in the middle. This may be labeled "wise use".

16. With the youngest school age groups a portable bulletin board may be used which would depict a camping scene. Drawings of papers, garbage, litter, etc., could be pinned to the board in various places along with other unsafe conditions. The children are called upon to rectify the scene. As they point out each error, the cutout is moved to its proper location on the board.

STUDENT GROWTH CHARACTERISTICS & MAJOR CURRICULUM SUBJECT MATTER BY GRADES

A basic understanding of children's behavioral patterns can aid in developing a successful program. The following table defines general growth characteristics within the 12 grades, and the types of subjects students study in the social studies and science fields.

Grade	*Growth Development Characteristics*	*Subject Matter Social Study*	*Science Subject Matter*
1	Becoming self dependent Make own decisions Imaginative Restless, noisy, vigorous Impulsive	Home to neighborhood	How animals and plants live. Weather changes affect animals.
2	Short attention span Active Accept changes if explained Imitate people	Our neighborhood	How do living things differ? What do we know about weather?
3	Accept group decisions Boundless energy Seek approval Group activities	Our community and its history	How do plants and animals live? How is work made easier? What makes earth's surface?
4	Strong response to loyalty Wide range of interests Strong desire for group activities May overtire easily Learn use of dictionary	Geography of globe & type of regions (4th or 5th grades)	How do we group the things around us? What are the needs of living things? Astronomy and use of magnets.
5	Muscular coordination good Great need for hobby interest Cliques among best	State & U. S. geography, & history of U. S. possessions (4th or 5th grades)	How do living things live together? How can plants and animals be more useful? What makes things move? Of what are things made?
6	Loud voice in social situations Individuality Need of variety of activities	Our Western hemisphere	How are plant and animal bodies formed? What do the rocks tell about plants and animals? Air pressure, sound, weather changes.
7	Changing voice Eagerness for new expression Strong loyalties General inquisitiveness Yen for stories	Our Eastern hemisphere	In what kind of world do we live? What is the nature of fire and its control? How is the balance of life maintained?

Grade	*Growth Development Characteristics*	*Subject Matter Social Study*	*Science Subject Matter*
8	Changing voice Eagerness for new expression Strong loyalties General inquisitiveness Yen for stories	U. S. History	How are the surface features of the earth made? How do we control heat? How do our bodies work? How does life continue on earth?
9	Keen competition Prestige is important Should develop good sportsmanship Personal appearance	The World Today	How are plants classified? How has man adapted to his environment? How did plants and animals develop through the ages? How do we conserve natural resources?
10	Reach physiological adulthood but lacks know-how Emotional instability Hero worship Need worthy causes	World History	Earth and space science Geology Astronomy Meteorology
11	Reach physiological adulthood but lacks know-how Emotional instability Hero worship Need worthy causes	U. S. History & Government	Biology Living food factories Living chemical labs. Why living things behave as they do.
12	Reach physiological adulthood but lacks know-how Emotional instability Hero worship Need worthy causes	Modern Problems	Physics Chemistry Basic structure of matter

SAMPLE CLASSROOM PRESENTATIONS

Primary

Trees

I. Two kinds of trees
  - A. Evergreen: Douglas-fir, hemlock
    Uses: construction of houses, churches
  - B. Broadleafs: maple, oak
    Uses: furniture

II. Tree Parts (have child draw tree on board)
  - A. Roots: hold tree upright
  - B. Trunk: supports crown, contains wood
  - C. Leaves: little factories which manufacture sugar and give off 0_2.

III. Items Made from Trees
  - A. Wood products
  - B. Paper products
  - C. Chemical products

IV. Uses of the Tree in Forest
  - A. Recreation
  - B. Wildlife homes
  - C. Help make soil
  - D. Erosion control

OUTDOOR ACTIVITIES

Show and discuss individual species, and parts of trees. Show how forest litter helps prevent erosion.

Water

I. The Nature of Water
  - A. Wet, liquid, flows downhill
  - B. Water is everywhere — rivers, lakes, oceans, snow, ice

II. Every Living Things Needs Water
  - A. Plants
  - B. Animals

III. Other Uses of Water
  - A. Power source
  - B. Transportation
  - C. Recreation
  - D. Home for wildlife
  - E. Industrial

IV. The Water Supply
  - A. Abundance and scarcity (seasonal and geographic variations)
  - B. How we seek to balance the two:
    1. Storage reservoirs, flood control
    2. The soil as a reservoir, watersheds

V. The Quality of Water (siltation, pollution, etc.)

OUTDOOR ACTIVITIES

1. Look for water around you — in the ground, sky, plants.
2. Follow a stream by trail — notice quantity and quality, plants growing in and around. Look for aquatic life.
3. Take water samples and examine after allowing to set.
4. Make a paddle wheel to show water as a source of power.

Wildlife

I. Name some of the animals that might be found in the forest. (Let children name them)

II. What do all animals need for survival?
  - A. Food — berries, insects, nuts, etc.
  - B. Water
  - C. Shelter — provided by forest.

III. Predators

Necessity of not killing all predators — nature's way of keeping controls on population.

OUTDOOR ACTIVITIES

Look for tracks, browse damage, birds nests, etc. Point out cover of various types of animals.

Recreation

I. What types of forest recreation can you think of? (Ask students to answer)

II. Why are the forests important to recreation?

   A. Forests provide a home for wildlife (hunting, fishing, photography, etc.)

   B. Forests provide the necessary cover to protect us from weather while camping, hiking, etc.

   C. Forests provide watershed control so that we have rivers to swim in in summer, etc.

III. How can we help to protect the forests to insure a pleasant place for recreation?

   A. Smokey Bear message

   B. No litterbugging

   C. No vandalism

OUTDOOR ACTIVITIES

Use visual aids such as pieces of equipment used in outdoor recreation, vandalized signs, etc. Visit campground.

Fire

Question: What happens when a fire starts in the woods?

Attention Getter: Light a match and comment — "This tiny flame could cause a whole forest to burn."

I. Detection

   A. Lookouts

   B. Aerial observation

   C. You

II. Communication (radio, telephone)

III. Attack

   A. Ground crew, equipment

   B. Smokejumpers

   C. Aerial retardants

IV. Control

   A. Fire line, take away forest fuels

   B. Mop up — "dead out"

V. Result of Fire

   A. Forest resources destroyed

   B. Need to renew the resources

VI. Prevention

   A. Smokey the Bear, what he tells people

   B. You can help

OUTDOOR ACTIVITIES

1. Build a safe campfire. Put a fire 'dead out".
2. In a controlled area, see how fast fire spreads in dry and wet areas. See the results of a forest fire.

Intermediate Grades and Above

Trees

I. Identification

   A. Deciduous: alder, maple, oak (local species)

      Uses: furniture, pulp, trim

   B. Coniferous: Douglas-fir
      hemlock
      pines

      Uses: lumber, plywood, pulp

II. Definition of Sustained Yield

   Example: Take 100-acre stocked tract — cut one acre and replant each year. At conclusion of last acre, the first one is ready to recut — continuous operation.

III. Timber Stand Improvement
  - A. Thinning: suppressed and dominant
    - 1. Thinning Xmas trees
    - 2. Corral poles
    - 3. Car stakes, etc. — potentially merchantable
  - B. Pruning: knot-free lumber is more valuable
    - 1. Douglas-fir — self pruning
      Pine — must prune

IV. Harvest Methods
  - A. Clearcut — Douglas-fir region
  - B. Selective cut — pine region

V. Reforestation
  - A. Natural
  - B. Artificial
    - 1. Seeding — cone collection and processing, helicopter
    - 2. Planting—nursery stock, hand planting

VI. Forest Estimates
  - A. Animals — deer, porcupine, rabbits
  - B. Fire — lightning and man-caused
  - C. Insects & Disease — wood borers, defoliators, fungi

QUESTIONS AND ANSWERS

In the classroom use visual aids liberally throughout presentation — leaves, bark, cones, etc. For field use point out the trees and examine them, take students into densely stocked stand, examine rings on a freshly cut stump, etc.

Natural Resource Conservation

I. Introduction
  - A. We are glad to be your guest today to talk about the leather in your shoes, the water you drink, the carton your milk came in this morning, etc. These things came from our natural resources — resources that need our care and attention.
  - B. Statement: "A nation deprived of liberty may win it, a nation divided may unite, but a nation whose natural resources are destroyed must inevitably pay the penalty of poverty, degradation and decay" — so said Gifford Pinchot, first Chief of the U. S. Forest Service.

II. Natural Resources
  - A. What they are:
    - 1. Definition — nature's wealth — can be drawn upon to meet a need.
    - 2. Call on the class to name some natural resources (write down on easel as group names them). (Renewable — water plants, wildlife; nonrenewable — soil, minerals)
    - 3. Display map of Region, Forest, or District, indicating the resources that are found in this particular area. (Might use slides for this.)
  - B. What we get from them:
    - 1. Display chart "What we get from Forest Lands." Discuss this.
    - 2. Examine each resource with the group — list some of their uses (important, unusual, or otherwise).
      - a. Wood — houses, churches
      - b. Water — swimming, irrigation
      - c. Grass — beefsteak, wool
      - d. Wild animals — hunting, photography
      - e. Minerals — rings, bracelets
      - f. Soils — vegetables, trees

C. What they mean to you:

1. Weekend hunting trip with Dad, an afternoon picnic.
2. A good job for Dad.

D. What they mean for all of us:

1. Provide prosperity
2. Provide security
3. Make our country strong
4. They are a part of our great American heritage (it is well to include a patriotic theme wherever possible).

III. Summary

A. Distribute a "take home" item such as a forest brochure, etc.

B. Express appreciation to school, teachers, etc., for opportunity to be in the class.

Natural Resources in Economics

Introduction:

Ask question, "What is economy?" Get answer from group discussion and direct collective answer to careful management of wealth, resources, etc., avoidance of waste by careful planning and use.

Economics is the science that deals with production, distribution and consumption of wealth.

Ask: How did we get our economy?

Answer: From our storehouse of natural resources.

Ask: What are these resources? Let's look at them. (Have a slide showing local resource management areas and discuss how local economy is based on flow and management of these resources.) Are parents of students in class dependent on these resources, etc.?

After slide show:

Let's take the automobile, for example, we need —

iron — from Minnesota, Venezuela
nickel — from Canada
copper — from Colorado
tin — from Malaya
cellulose (for plastic seat covers) — from Oregon
coal (for heat & energy) — from Pennsylvania

A flow of thousands of materials processed in thousands of factories through thousands of processes, each consuming: electric power, coal, oil, water, time and human energy — all for birth of auto. We are not finished then; we feed it gas, oil, waxes, repaint, replace gears, and then junk it.

Each person's share of raw material each year is:

14,000 lbs. — fuel for heat & materials
10,000 lbs. — building materials
1,600 lbs. — food
5,000 lbs. — ore
4,100 lbs. — other agricultural products
800 lbs. — other

35,500 lbs. — natural resources per person per year in U. S.

Your share of water used in U. S. alone is 375,000 gallons per year.

The U. S. has 6% of the world's population and we use over one half of all the raw materials in the world. We need 29 minerals vital to our economy, and we import 18 of these from outside our borders. This makes it pretty important what happens in Malaya or Chile, etc.

So what !

As world populations increase and other nations develop higher standards of living, resource uses increase. Therefore, it becomes more vital than ever to practice conservation of natural resources.

Other variations:

Discuss current newspaper articles dealing with resource problems.
Discuss local resource problems, such as urbanization, tourism, air pollution and water pollution effects, greenbelt theory, county zoning and planning criteria, etc.

Career Day Program

(For a Career in the U. S. Forest Service)

I. Ask question: "Why did you sign up for this group?"

II. Barnstorm question with entire group: "What jobs are done in the Forest Service?"

1. Rec. Mgt.
2. Range Mgt.
3. Timber Mgt.
4. Engineering
5. Hydrologists
6. Civil engineers
7. Logging engineers
8. Landscape architects
9. Building architects
10. Draftsmen
11. Pilots
12. Bridge engineers
13. Dam & concrete engineers
14. Heavy equipment operator
15. Mechanics
16. Accountant
17. Management
18. Personnel manager
19. Entomologists
20. Journalists
21. Pathologists
22. Fire scientists
23. Meteorologists
24. Geneticists
25. Wildlife biologists
26. Soil scientists
27. Business mgt. administrator
28. Smokejumpers
29. Data processing personnel
30. etc.

It takes many jobs to run a land management agency or organization.

III. Three types of employment (list advantages & disadvantages of each)

1. Profession (like forester) (college degree) wide career ladder.
2. Profession (like technician) (non-college) restricted career ladder.
3. Part-time or summer-type jobs. Helps complete bulk of summer or seasonal jobs.

IV. Personal characteristics — Discuss list on promotion roster and talk about requirements for advancement.

V. Living conditions

Field type or Ranger Station — usually in small communities.

VI. Women's jobs — Have an important place in organization.

public relations with youth and women's organizations
research jobs
clerks
stenographers
business mgt. at District and Forest level
personnel officer
draftswomen
architects

VIII. Things to consider in applying for any job

1. Be sure you work at something you enjoy doing.

   18 yrs. old — Federal government. Some 17 yr. old — State agencies.

3. Follow up with visit or phone call to make sure employer knows you are still interested.
4. Don't make blanket application all over Region. Stick to one application at a time.

Soils Resource

(Use visual aids where possible)

I. Natural Resources

- A. Renewable
  - 1. Soil, water, plants, etc.
- B. Non-renewable
  - 1. Coal, oil, gas, minerals, etc.

II. Nature tends to maintain a balance

- A. Cycles have developed
  - 1. Plant
    - a. Plant food elements
  - 2. Animal
- B. Interrupted by man's use

- III. Factors to conserve natural resources
  - A. Beneficial use with minimum waste
  - B. Productivity maintained or increased
  - C. Divide use for present people and future people
- IV. Demands are increasing
  - A. Increasing population
  - B. Higher standard of living
- V. Soil, the basic renewable natural resource
  - A. What is soil:
    - 1. A collection of natural bodies occupying portions of the earth's surface that supports plants and has properties due to the integrating effect of climate and living matter acting upon parent materials as conditioned by relief over a period of time.
  - B. How does it form:
    - 1. From the weathering of rock.
    - 2. Soil inherits the original minerals and the weathered products of the original minerals in the rocks.
    - 3. Kinds of rock:
      - a. Igneous — volcanic
      - b. Sedimentary—redeposited
      - c. Metamorphic — changed by heat and pressure
    - 4. Kinds of rock weathering:
      - a. Physical
        - (1) Freezing and thawing
        - (2) Wave action
        - (3) Heat by sun
        - (4) Running water
        - (5) Wind
        - (6) Gravity
      - b. Chemical
        - (1) Solution
        - (2) Oxidation
        - (3) Hydiation
        - (4) Hydialysis, etc.
      - c. Biological
        - (1) Pressure of roots in fractures, etc.
  - C. Kinds of soil
    - 1. Mineral
    - 2. Organic
      - a. 20 - 30% organic matter
  - D. Composition of mineral soil
    - 1. 45% mineral
    - 2. 30%. water
    - 3. 20% air
    - 4. 1 - 5% organic matter
  - E. How soils differ
    - 1. Color
    - 2. Depth
    - 3. Texture
    - 4. Structure
    - 5. Consistence
    - 6. Permeability to air, water & roots
    - 7. Kind of clay minerals
    - 8. Arrangement, thickness & kind of horizons
    - 9. Organic matter
    - 10. Reaction (pH)
    - 11. Content of plant food nutrients
    - 12. Soluble salts
  - F. Why soils differ
    - 1. As soils form, they are influenced by the action of:
      - a. Parent material
      - b. Climate
      - d. Organisms, animals & man
      - c. Topography
- VI. Soil Classification
  - A. Just as plants and animals are grouped in a multiple category system of levels ranging from the general to the specific, soils can also be so arranged.

1. The specific levels are the most useful
    a. Series and type of soils
        (1) A soil series is a group of soils having similar physical and chemical characteristics in their profiles. Such a group is given the name of a local town or landmark.
            (a) Willamette, Newberg, Cascade, Chehalis, etc.
        (2) The type is the name of the surface texture:
            (a) Silt loam, sandy loam, clay, etc.

VII. Soil Maps

A. Soils are 3-dimensional
    1. Occupy a portion of the landscape
B. Soils have phases
    1. Shallow to bedrock, deep to bedrock, slightly sloping, very steeply sloping, overflow, etc.
C. Series types and their phases can be delineated on an aerial photograph.

VIII. Interpretative Groupings

A. Land Capabilities
    1. Grouping soils according to their hazards and limitations for long-time use and management.
        a. Capability Classes I, II, III, IV — suitable for agricultural use.
        b. Capability Classes V, VI, VII — suitable for woodland pasture, range, wildlife, recreational and watershed uses.
        c. Capability Class VIII suitable for wildlife and recreation, and watershed purposes.
B. Range sites
C. Woodland sites
D. Engineering
    1. Roads, dams, etc.
E. Urban development
F. Recreation & wildlife
G. Tax appraisal

IX. Conservation Practices

A. Agricultural land
    1. Drainage
    2. Irrigation
    3. Erosion control
    4. Water storage
    5. Crop rotation
B. Pasture management
    1. Grass-legume seedings, rotation grazing, fertilization.
C. Woodland management
    1. Regeneration, cultural practices, erosion control, windbreaks, harvest cutting.
D. Range management
    1. Reseeding, deferred rotation grazing, water development, proper use.
E. Wildlife management
    1. Waterfowl wetland development, fish pond development, food and habitat development.
F. Recreation
    1. Area stabilization & planting, water development, trails and walkways, drainage and irrigation.

Water Resource

(Use films or other visual aids when possible)

- I. All life needs water
  - A. Animal requirements — man a porous sack of water (70% H_20).
  - B. Plant requirements — 500-1000 parts, each plant a living fountain.
- II. Origin of Water
  - A. Water Cycle
    - 1. Evaporation from water and plant surfaces
    - 2. Condensation
    - 3. Rain or snow
    - 4. Runoff — streams and underground
  - B. Make water cycle application to your local area
  - C. Distribution of Water
    - 1. On Earth
      - a. 97% of earth's water is in oceans
      - b. 3% of earth's water is on land
    - 2. On Land
      - a. 75% in polar ice & glaciers
      - b. 10% in ground from 0' to 2500' elevation.
      - c. 12% in ground from 2500' to 13,000' elevation.
      - d. 3% in lakes & rivers

  (¼ of 1% of money spent on development goes into basic research on H_2O.)
- III. Possibilities for Increasing Water for Use
  - A. Cloud seeding
  - B. More storage in soil (by vegetal control, contours, etc.)
  - C. Storage in underground basins
  - D. Reduction transpiration losses
  - E. Storage in surface reservoirs
  - F. Plant breeding or using plants which require less H_2O.
  - G. Purification of sea H_2O (oceans 3½% salt)
  - H. Increased re-use of H_2O
  - I. Evaporation reduction — Hexadeconal
  - J. More efficient irrigation, sprinklers, lined ditches
  - K. Reduction of waste in homes, yards
  - L. Meter installations
  - M. Piping water in canyon bottoms.
- IV. Major uses of water
  - A. Wholly consumptive
    - 1. Evapo-transpiration
  - B. Partially consumptive
    - 1. Irrigation (30% returns to streams)
    - 2. Industrial (90% returns to streams)
    - 3. Domestic & municipal (60% returns to streams)
    - 4. Animals (domestic and wild)
  - C. Non-consumptive use:
    - 1. Development of hydroelectric power
    - 2. Navigation
    - 3. Recreation — swimming, boating, fishing
    - 4. Transport of wastes
- V. Priority of Use
  - A. Domestic
  - B. Municipal, including farm use
  - C. Irrigation
  - D. Power development (hydro & steam)
  - E. Pollution abatement or dispersal of pollution
  - F. Industrial
  - G. Mining

H. Fish and wildlife

I. Recreation — swimming, boating, fishing

J. Transportation

VI. Value of Water

A. Value of an Acre-foot of H_2O in 1958

	Mean $	*Max. $*
1. Domestic	$100.19	$235.66
2. Industrial	40.73	163.35
3. Irrigation	1.67	27.04
4. Power	.71	5.90
5. Waste Disposal	.63	2.56
6. Inland Navigation	.05	1.17

VII. Factors Affecting Purity of Water and Tolerance for Human Use

A. pH — near neutral is desirable.

B. Bacteria viruses — no pathogenic bacteria or viruses.

C. Poisons — none.

D. Suspended solids — 0-10 parts per million acceptable.

E. Dissolved solids — 10-100 parts per million acceptable.

F. Color — clear is preferred.

G. Taste — neutral preferred.

H. Trace elements — should be present.

I. Temperature 40° - 60° preferred.

Purity a relative term, certain industrial requirements exceed municipal.

VIII. How Water is Wasted

A. Runoff

B. Loss of quality

1. Removal of vegetation by logging, grazing, fire, roads.
2. Improper farming
3. Ill-advised drainage
4. Industrial misuse
5. Municipal misuse

a. Known — Paratyphoid
Typhoid
Dysentery (animals & birds)
Amebic dysentery
Cholera

b. Suspected — Tularemia
Infectious hepatitis
Infantile paralysis

IX. What Can Be Done to Improve Conditions

A. Better land and resource management

B. Store water underground

C. Reduce pollution by industry

D. Treatment of municipal wastes

E. Care in handling wastes from boats

X. What Can I Do to Protect Water Supplies

A. Learn principles of watershed management — become informed

B. Analyze community needs and vote for them

C. Encourage public interest

D. Maintain good personal habits — "Why don't they do something" who are "they" but you.

XI Water Use Volumes

Gasoline 1 gal. = 7-10 H_2O
Automobile 1 = 50M, 100M, gals.
Hospital (bed) = 135 gals. per day
Office (room) = 300 gals. per day
Beef (1 lb.) = 1318 gals.
Paper pulp (1 ton) = 65,000 gals.
Record — hi fi — 2½ gals.
Restaurant (meal) 4-5 gals.
City — per person = 150 gals. per day

Plant Resource

(Use films or other visual aids when possible)

I. Introduction

A. Limitations:

1. Term "plant" is broad.

2. Potential subject matter is unlimited.

3. Much is too technical to be of significance to children (and teachers?).

B. Approach:

1. Term "plant" will be defined as the Forester understands it.

2. Plants will be related to other resources (environmental factors).

3. Discussion will be limited to those concepts most significant.

II. What Can We Say About Plants Alone? (without reference to other resources)

A. Basic definition: (the Oxford Universal Dictionary)

1. Vegetable

a. "A living organism belonging to the vegetable kingdom."

b. "A growth devoid of animal life."

c. "A plant cultivated for food."

Thus: not animal; not mineral.

2. Plant

a. "A member of the vegetable kingdom; a vegetable;"

b. "generally distinguished from an animal by the absence of locomotion, and of special organs of sensation and digestion, and by the power of feeding wholly on inorganic substances."

Only thing that saves this definition is weasel word "generally."

(1) locomotion (diatoms have power of locomotion) (plants do travel by water, wind, animals)

(2) sensation (phototropism — geotropism — sundew)

(3) digestion (pitcher plant, Venus fly trap)

(4) inorganic (saprophytes)

Hence, no simple definition.

B. This does point to things we can say about plants:

1. They are characterized by diversity:

a. variety — thousands of species.

b. size — from the one-celled diatom to the redwood.

c. range — (mountain + desert plain + ocean depth) throughout the earth.

d. habits — distributed according to their growth habits and needs.

2. They are converters of the sun's energy:

$$CO_2 + H_2O + \text{sunlight} \xrightarrow[\Delta \text{ (Chlorophyll)}]{\qquad\qquad} \text{food sugars} + H_2O$$

3. They are renewable. Thus the basis for man's management of the forest.

4. They have no real significance apart from their existence in community with other natural resources . . . soil, water, wildlife, other plants . . . and man himself.

This is the Forester's approach to the topic . . .

This, in a broad sense, is the meaning of the Forest Community.

III. Soil in the Forest Community

- A. Soil is the basic resource upon which all others depend.
- B. Soil is renewable, but only over a long time span.
- C. Plants help to make soil:
  - 1. Forest litter (humus)
  - 2. Organic fertilizer (plants eaten by animals)
  - 3. Root systems (aeration — organic matter — nitrogen)
  - 4. Breaking down of rock (lichen — moss — roots — weather)
  - 5. Decomposition of wood (saprophytes — fungi)
- D. Soil determines what plants will grow:
  - 1. Depth (lichen & moss — cultivated crops)
  - 2. Structure (hardpan — friable — rocky)
  - 3. Chemical content (acid, alkaline)
  - 4. Parent material (rich in organic & trace elements: phos — pot — nitro)
  - 5. Climate (rainfall & temperature)
  - 6. Topography (valley bottom — bench-mountain)
  - 7. Aspect (north — south — east — west)
  - 8. Elevation (life zones:

    Alpine — Arctic, Alpine
    Upper — Hudsonian, Canadian
    Principal — Transition (humid)
    Transition (arid)
- E. Soil and plants interdependent
  - 1. Soil:
    - a. anchors plants
    - b. provides minerals
    - c. supplies water
  - 2. Plants:
    - a. hold the soil in place
    - b. supply organic matter and minerals
    - c. keep soil friable
    - d. regulate the watershed

IV. Water in the Forest Community

- A. Water, like soil, is a very basic resource.
- B. Water is renewable (but not inexhaustible).
- C. Water affects plants and soil:
  - 1. Amount that precipitates:
    - a. effect on plant growth (Olympic Rain Shadow).
    - b. effect of soil (too much — acid; too little — alkali)
  - 2. Amount that stays in soil (swamp)
- D. Plants affect water:
  - 1. Role in water cycle (transpiration).
  - 2. Break fall of water (surface water).
  - 3. Distribute water gradually (ground water).
  - 4. Protect water purity (less soil disturbance).
  - 5. Use water (decrease supply).

V. Animals in the Forest Community

- A. There is a wide variety of animal life in our Forest community.
  - 1. microorganisms in soil & water
  - 2. insects
  - 3. vertebrates (shrew—elephant)
- B. Animals are a renewable resource.
- C. Animals aid plants by:
  - 1. providing a healthy soil
  - 2. carrying seed
  - 3. giving off CO_2, which the plants use to make food.
- D. Some animals are destructive to plants: insects, porcupine, deer.

E. Plants affect animals by:

1. Providing oxygen (especially important to fish)
2. Providing food (concept of "edge")
   (illustration of bass — perch — algae)
3. Providing shelter.
4. Providing water.
5. Combination of the above requirements determines what kind of animal lives where.

VI. Plants in the Forest Community

A. There are a wide variety of plants.

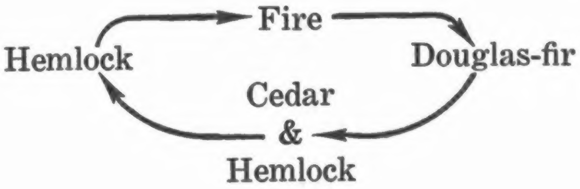
B. Plants are a renewable resource.

C. The type of plant that grows in a given area is determined by many interacting factors.

1. Soil, water, animal effects have been covered.
2. Weather, life zones, natural catastrophes (e.g. fire, slides, beavers, etc.)
3. Light (tolerant, intolerant)

D. Plants change (and are changed) by their environment:

1. Lichen ⟶ Moss ⟶ Trees



2. Competition
3. Climax

VII. Man and the Forest Community

A. Man is a relatively late arrival in the community.

B. In his short span of existence, man has had a disproportionate effect on his environment.

1. Intellect
2. Tools
3. Time

C. Man's influence on his environment can be either good or bad.

1. Bad examples are not hard to find:
   - a. Asia and the Middle East
   - b. Africa
   - c. United States
     - (1) Exploration
     - (2) Exploitation
     - (3) Retrenchment (end of the frontier)
   - d. Local area ——————
     we see same happening locally.

Cultures are influenced by the kinds of plants they can grow. Man seeks food, clothing, shelter and warmth. His actions are shaped by these needs. Strong nations grow most of what they need, but none grow all.

2. It is the good examples that hold the long-range hope for man's survival.

   We must recognize our dependence on the natural resources and work with nature, not against her.

   Let us see how man, through proper management, assures a continuous supply of the renewable resources for the long-range benefit of all:

   (Multiple Use slide set)

Forestry Presentation

I. Forest Resources

Draw circle of renewable resources on easel board and discuss how these resources apply to all forest lands, and how land managers must consider the management of these resources with respect to the most important resource of all — SOIL. It is not considered renewable within our lifetime; therefore it is vitally important that it be protected, maintained, and enriched.

A. Renewable Resources (These resources are dependent on soil and the basic resource, soil, is vital to our very existence)

1. Water — Most important renewable resource. Highest priority is for domestic use.
   eg: Oregon is 3rd state in nation in hydroelectric power production.
2. Wood — Largest forested area of any state in nation except Alaska. eg: 54% of all jobs in Oregon are connected to wood-using industry.
3. Forage — Important for summer range for cattle and sheep.
4. Wildlife — $3½ MM annual income for Oregon in license fees and $28 MM commercial fishing industry.
5. Recreation — This resource creates greatest impact on all forest land today; an industry with annual value in excess of $400 MM in Oregon.

Discuss some of the important management aspects and resource interrelationships of the above.

B. Nonrenewable Resources

Minerals — 10 times greater production now than 50 years ago.

II. Plant Life (*We are dealing mainly with plant life in this session.*)

A. How a Tree Grows (Use chart. Bring out the plant-animal relationship — oxygen is released by plants for use by animals.)

B. Forest Management

1. Terms to define:
   - a. Climax species
   - b. Tolerant
   - c. Intolerant
   - d. Rotation
   - e. Sustained yield
   - f. Landscape management areas

   These also apply to management aspects of all resources

2. Forests in N. W. (Discuss why the different forests are found here)
   - a. Douglas-fir Forests — Humid Transition Zone
     - (1) Forest types found in Humid Transition Zone:

       spruce-hemlock — on coast

       Douglas-fir — widespread

       true-fir, mountain hemlock — West Cascades
     - (2) Douglas-fir Management
       - (a) Silvicultural characteristics:
         - (aa) Intolerant species
         - (bb) Even-aged stands

2

- (b) Harvesting techniques:
  - (aa) Clear-cut harvest units — staggered settings.
  - (bb) Tree selection — commercial thinnings, miscellaneous products.

b. Ponderosa Pine Forests — Arid Transition Zone

- (1) Forest types found in Arid Transition Zone:
  - lodgepole—young immature soils
  - larch — moist north exposure
  - ponderosa pine — widespread
  - juniper-grass — lowlands, very arid
- (2) Ponderosa Pine Management
  - (a) Silvicultural characteristics:
    - (aa) Intolerant species
    - (bb) Uneven-aged stand
  - (b) Harvesting techniques:
    - (aa) Selective cutting
    - (bb) Tree selection, high risk

3. Timber Stand Improvement

a. Regeneration

- (1) Natural Reproduction
  - (a) Seed years (every 4 to 7 years)
  - (b) Site preparation (mineral soil for D.F., P.P.)
- (2) Artificial Reproduction
  - (a) Direct seeding — hand & helicopter (Use seed packets in classroom)
  - (b) Planting (hand & machine)

b. Thinning and Pruning

- (1) Methods used — hand pole saw, power saw attachment (Demonstrate thinning by using seed flat in classroom; thin ½ of flat, leave other ½ unthinned)
- (2) Economic Significance
  - (a) Thinning produces greater tree volume
  - (b) Pruning produces better quality

4. Influences on the Forest

a. Fire — greatest potential enemy — most spectacular

- (1) Nine out of ten fires still man-caused
- (2) Annual losses
- (3) Preventive measures
- (4) Discuss fire triangle

b. Insects

- (1) Kinds — bark beetles, defoliators, borers
- (2) More trees killed each year by insects than by any other influence.

c. Disease

- (1) Kinds — butt rot, top rot, blister rust, mistletoe
- (2) How trees are infected
- (3) Losses
- (4) Control measures — harvest overmature trees, managed stands

d. Other
   (1) Animal damage — porcupine, bear, deer, rodents
   (2) Weather — Columbus Day Storm
   (3) Humans — litterbugs, fire, vandalism

5. Farm Wood Lot Management
   (1) Farm Forester Assistance
   (2) Tree Farms (Use Chart-Products of a Tree Farm)

   (Point out the continuing income that can be realized from wood lot management. It is not necessary to wait 10 or 100 years to attain an income or increase value of a stand of timber. Refer to USDA publication "Special Forest Products for Profit".)

6. State Forestry Conservation and Fire Laws
   Discuss importance to wood lot and small forest owners.

7. Forester's Tools
   biltmore stick
   abney
   compass
   increment borer
   volume tables
   diameter tape

8. Discussion of teaching aids and packets for classroom use.

9. Tree Identification — use Trees to Know booklet for your state.

10. Questions

Use the film "The Forest" as a good wrap up.

Wildlife Resource

(*Use visual aids when possible*)

I. Write on the blackboard or flip chart this true-false question:

A. There is more wildlife today in the Northwest than when Lewis and Clark traveled down the Columbia River?

Ask the participants to raise their hands to vote — True? False?

Those that voted true are probably right. Discuss why.

B. How do we know?

1. Lewis and Clark Journals note scarcity of food animals — they bartered with Indians for dogs and dried salmon.
2. Wildlife thrives in open sunlight patches created by land clearing — (use example of agriculture — patch logging).
3. Man has created artificial habitat. (Examples: Columbia River Basin reclamation water created agricultural crops and furnish food for animals.)
4. Man has successfully introduced species. (Examples: Chinese pheasant, chukar, Rocky Mtn. elk in Washington-Oregon)

II. What is wildlife?

A. Have participants list the groups of animals they consider wildlife. They should have fish, mammals, birds, clams, crabs and crayfish and probably reptiles and amphibians.

B. Why is wildlife important to us? Answer to shoot for — "It is useful."

III. How is wildlife useful to man? List answers on board — should include esthetic, economic, hunting and fishing, sight-seeing (just looking), photography, clam digging, therapeutic (release of tension instead of using tranquilizers — keep healthy), better place to live because we know they are there.

IV. There are more species of wildlife in Washington and Oregon than interior states.

Using a relief map of state point out examples of species related to various habitats (i.e., salt water — clams, crabs, salt water fish and mammals, birds associated with salt water — migratory fish streams — high rainfall areas — western lowlands — mountains — arid eastern plateaus and Rocky Mountain foothills).

V. All wildlife has basic needs for survival. Everything man does to the land affects wildlife habitat.

A. Those needs man can manipulate:
  1. Food
  2. Cover
  3. Water

B. Those man controls only in a minor way, if at all:
  1. Air
  2. Sunlight
  3. Climate
  4. Built-in factors — reproduction, defense, escape, protective coloration.

VI. Introduce film "A Way of Life" (Missouri Conservation Commission, Jefferson City, Missouri, $170.00) or another film on animal ecology.

Discuss — what major concepts were emphasized in the film?

Points to make:

1. Carrying capacity — any area has food enough for only a limited number of each species present.
2. Winter is usually the "bottleneck" period.
3. Each year there is a surplus of every species produced.
4. Man can harvest some of this surplus.
5. Wildlife is a renewable resource.
6. Nature is constantly changing. There is no "status quo" or exact "balance".
7. Wildlife belongs to all of us.

VII. Management Problems

A. Many problems develop because everything man does to the "land" affects wildlife.

B. Discuss a current conflict or problem relating to wildlife in the vicinity where this is presented.

VIII. "Who and Where". Agencies that work with wildlife and wildlife habitat:

A. Local

B. State

C. Federal

D. Industries

E. Private Groups

IX. Conclusion

Wildlife and the out-of-doors are an attractive peg on which to hang all other learning. Make the outdoor classroom a productive tool in your teaching.

References: Wildlife Management and Conservation, James B. Trefether, D. C. Heath & Co., Boston, 1964. Science & Resource Series.

Outdoor Soil Presentation

(1 hour — 30 minutes)

I. Introduction and Tree Growth Needs

Most of the foods we eat, most of the clothes we wear, and a good share of the things we use in everyday living are products of the soil. This means that the soil is the basic forest resource.

Forests, like other crops, grow on and in the soil. Let's see how plants and the soil are dependent upon each other.

When we walk into a wooded area we notice that the climate is slightly different inside the forest than outside. On hot summer days it is cooler and on windy days it is warmer or less windy. The forest protects the soil by making the climate more moderate.

To see the soil we must dig a pit. On top of the ground will be a heavy layer of moss, limbs, twigs, rotten wood, leaves, and all sorts of dead and decaying material. This layer, called duff, is very important for it acts like a thick blanket of insulation protecting the soil. Temperatures beneath this blanket change slowly and do not get as high nor as low as they would otherwise. This blanket breaks the force of the raindrops and holds moisture until it can be absorbed by the soil. When runoff does occur, after heavy rains or when snow melts, the water will be clear rather than muddy. A thick duff layer is almost complete insurance against erosion. As the duff decays and is broken down by the soil organisms it is added to the soil as organic matter (called humus).

(Note: Have a soil pit already dug and have students point out layers of soil.)

Soil is not dead, inert matter but very much alive. It would have been much easier for Shylock to have collected his pound of flesh from Antonio without taking a drop of blood than it would be for us to separate the living and nonliving parts of the soil. A shovelful of forest topsoil might contain from ten to fifty billion organisms — bacteria, fungi, and larger organisms.

(Have class put handful of duff on piece of paper and look for living things. Take temperature of different horizons.)

Like other living things, trees require nutrients (food), water, and oxygen (air). In addition, the soil provides anchorage and support for the tree. Roots will not live in a soil unless all these elements are present. Trees grow faster on good soils than poor soils. Here are some of the factors which help determine the rate of tree growth and show how trees are dependent upon the soil.

(Point out to class and get group discussion on these points.)

A. Plant food. Comparison of food needs of trees with our need for food.

B. Adequate moisture.

C. Soil depth. Some soils are very shallow. Others are many feet deep. The deeper the soil is, the better it is for tree growth. A good clue to soil depth is the penetration of the roots. Rock, coarse gravel, cemented layers, a claypan, or a high water table will limit the penetration of roots. Deeper soils provide better anchorage and support for trees.

D. Soil drainage.
   1. Depth
   2. Aeration

E. Sufficient light. Function of leaves.

II. Illustration of Part I from Pit

A. Duff layer. Importance and function.

B. Soil depth in regard to:
   1. Moisture
   2. Drainage

C. Root Feeding Zone. (Measure depth roots go into ground)

Organic matter. This is the material left when plants, animals — all living things — die and decay. Surface soil is usually darker because it has higher content of organic matter. Soils are more fertile and more productive as organic matter is increased.

D. Soil Texture and Structure. (Have students feel soil for texture)

Soil texture has to do with the size of the soil particles. Clay soils have very tiny soil particles. Gravelly soils have large soil particles. Trees do best in loam soils, which are mixtures of fine and coarse textured particles. Growth is poorer as the soil texture nears the extremes, clay or coarse sand.

Soil structure refers to the manner in which the soil particles cling together or are arranged. Tree growth is usually best where the soil has favorable structure, and structure is usually best under a healthy forest. With ideal structure, the soil is friable and crumb-like in appearance.

E. Soil Activities

1. Have students make soil micro-monolith.
2. Have students take pH of soil.
3. Have students feel and see structure of each horizon.
4. Observe soil-plant relationships in area.

III. Soils Have Different Names

Most areas have a wide range of parent material, vegetation, climate and topography.

A. The intersection of these factors with each other makes possible a large variety of soils.

B. Through examination of each kind of soil profile, one can determine how and why each differs from another.

Each kind of soil can be located on the landscape, and its location and extent can be delineated on an aerial photograph.

A good balance of the growth factors plus a favorable climate will result in a highly productive soil for forest crops. However, if any of these factors is not favorable, the growth will be less.

With the exception of wet, swampy areas, and some shallow clay soils, this county has the right soil and moisture conditions for growing excellent forest trees.

Outdoor Water Presentation

I. Introduction

A. What stream are we located on? (Have map for each student and let them mark your location.)

B. What watershed are we in? (Have students draw line around boundary of watershed and calculate size)

C. Are we in more than one watershed? How many?

D. What part of the stream are we in? (upper, middle or lower)
What criteria should we use?

II. Does this look like good water? Why?

A. What do aquatic plants & animals need to live? (food, water, shelter, O_2)

B. What would be some ways to tell if these things are in the stream?

III. How does O_2 get into water? (Discuss aeration, plants giving off 0_2)

A. Demonstrate Hach dissolved O_2 test procedure and have teachers determine how much O_2 is there.

B. Is this enough O_2? What is enough? (discuss controversy between biologist (7+PPM), industrialists (4PPM) and their compromise of 5PPM. How is pH affected in the water? (soil minerals, organic matter).)

IV. Do you think this stream will be acid or alkali? Why?

Take pH test in front of students and have them decide pH - go chart and have teachers decide what living things might be found in stream.

V. I wonder what aquatic life we will find in this water? (Demonstrate how to look for and collect aquatic plants &

insects without destroying the habitat. Spread out along the stream, look for & collect aquatic insects. Make an estimate of the water temperature before you put your hand in the water and after you put your hand in the water.)

- A. Was there a difference between the types of insects in the stream riffle & pool? Why?
- B. Have teachers identify aquatic insects from picture keys and check to see if they are the kinds we predicted would be in the stream. (Check temperature and tell class)
- C. Are insects affected by temperature? How is O_2 affected by temperature?

VI. Now let's see what the volume of water flowing in this stream is.

- A. What measurements do we need? (Average width, depth & feet per sec. stream is flowing). Have class get measurements and then calculate how many cu. ft. of water/second flowing in stream - convert to gallons/min., day).
- B. If each person's share of water is 150 gal./day how many people can live off the water in the stream?

Outdoor Plant Presentation

I. Introduction

- A. What do we know about plants?
- B. Briefly review how a tree grows; show cross section of tree.
- C. Discuss that trees grow where best adapted to their environment; this determines harvest methods.

II. Short tree identification, using local plant specimens.

III. Take field trip, review and discuss, as a group:

- A. Wild edibles present.
- B. Competition of plants for light and soil moisture —

  relate to natural pruning and thinning

  relate to man pruning and thinning
- C. Forest influences present, good and bad —
  fungus, insects, animals, wind
- D. Reconstruct natural and man-caused history of area.
- E. Climax plant communities.
  (End field trip at a tree adequate in size for group exercise in tree measurement.)

IV. Explain use of increment borer and bore tree. Have class determine the age.

V. Discuss what measurements are needed to determine volume of tree.

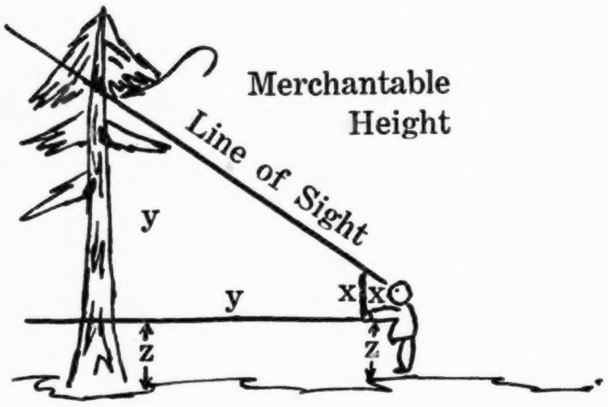
Relate to math in school.

- A. Take diameter with diameter tape and suggest that each student in class can make one with a piece of cloth tape. (Circumference expressed in units of diameter.)
- B. Have class record diameter.
- C. Explain determination of height of merchantable part of tree.

  Have class take height of tree by using a stick an arm's length long and two similar triangles of different size.

  1. Choose a stick the same length as from your hand to your eye.
  2. Hold stick upright to form a right triangle with your arm.
  3. Walk backward until the line of sight from your eye, over the end of the stick, coincides with the merchantable height on the tree.
  4. Measure the distance you are from the tree. This is the

height you measured on the tree. Add the distance from your shoulder to the ground for the total height.



If $x = x$ then $y = y$; then measured height $= y + z$.

Explain that this is a simple exercise that is accurate enough for their students to do.

5. Convert the height into number of 16' sawlogs and find board foot volume of tree. Relate number of board feet into common construction items.

This session is designed to give the teacher a background in outdoor activities and ecological information as it pertains to plants.

Outdoor Wildlife Presentation

I. Introduction

- A. Objectives: To provide and maintain the maximum population of game animals, game birds, game fish, and fur-bearing animals compatible with available wildlife habitat and food to permit an orderly harvest of surpluses in a manner that will provide the greatest benefit to the greatest number of citizens.
- B. Values of Wildlife
  1. As a crop.

     Crop includes big game, upland game birds, waterfowl, furbearers, migratory fish, trout, warm-water fish, predators, and miscellaneous species.
  2. For recreation.

II. Management is Based on *"Facts"*. (Research, census)

- A. Game Inventory — to determine what and how many are present.
  1. Habitat Census and Requirements — food, water, and shelter are essential. Point out examples in this area.
     - a. "Parker Transect" (Demonstrate the transact and identify plants for class.)
     - b. Habitat Improvements — guzzlers, range rehabilitation, food plantings, etc.
  2. Game Census Methods.
     - a. Direct counts — horseback, walk, plane, car.
     - b. Indirect counts — signs, tracks, droppings, browsing, hunter check, and trapping. (Observe tracking pit and traps that were prepared the night before.)

  (Have class look for tracks and signs of wildlife — look for overbrowsed plants.)
- B. Fishery Inventory
  1. Habitat Census and Requirements — to determine if habitat is suitable.
     - a. Water — temperature, O_2, purity, etc. (Class to work problem using HACH dissolved oxygen and CO_2 testing kit.)
     - b. Shelter — logs, deep water, rocks.

- c. Food — plankton, aquatic, etc. (Have group take bottom samples and identify using aquatic insect sheets.)

2. Fish Census
   - a. Spawning beds
   - b. Seine samples
   - c. Creel check

III. Other Activities (if time allows)

- A. Plaster casts of tracks.
- B. Have class sit still for one minute and list all the sounds they hear. (Relate this to helping the class develop their own senses.)
- C. Show simple No. 10 can trap, that class can make, but caution that when animals are caught they must be released in same area.

6 - OUTLINES FOR HIGH SCHOOL CONSERVATION COURSES

Conservation of natural resources should be emphasized in the existing courses in school. Some schools have developed special courses in Conservation or Forestry to fill an educational need or interest in this area.

Occasionally Forest officers are called upon to help develop such courses in high schools or colleges. Several course outlines are included here to assist in setting up similar courses.

The following schools have developed courses and manuals. Further information can be obtained by writing them.

Course	*School*	*Developed Text*
Forestry I & II	Lincoln High School Tacoma, Washington	Yes
Conservation	Bend High School Bend, Oregon	Yes
Conservation	Gervais High School Gervais, Oregon	No
Farm Forestry (Vo. Ag. Course)	Vernonia High School Vernonia, Oregon	No

A very complete study for forestry instruction is "Curriculum Outline for High School Forestry, Logging and Lumbering Instruction" by Roger Clemens from Education and Training Committee, Redwood Region, Conservation Council, 223 Rosenburg Bldg., Santa Rosa, California.

PROPOSED FORESTRY CLASS OUTLINE

The following is an example of a forestry course outline which has been successfully developed in high school.

I. Tree Species Identification (1½ weeks)
  - A. Coniferous
  - B. Deciduous, shrubs, and ornamentals
  - C. Distribution of species in:
    - 1. Your state
    - 2. United States

II. Parts of a Tree. How it Grows and Reproduces. (½ week)

III. Vocabulary of Forestry Terms (½ week)

The economic importance of forests in our state and to the Nation, and division of ownership.

IV. Forest Ecology
  - A. Soils, type, plant foods, moisture, depth, soil organisms. (2 weeks)
  - B. Influence of slope and direction slope on tree species.
  - C. Elevation, temperature, rainfall, and light.

V. Forest Management and Farm Forestry (1 week)

A. Harvesting
1. Clear cutting
2. Selective cutting

B. Timber Stand Improvement
1. Thinning
2. Pruning

C. Forest equipment — safety

VI. Forest Conservation and its Importance (1 week)

VII. Forest Products

A. Sawlogs, wood, fence posts, peeler blocks, piling, poles.
B. Ferns, shrubs, bark, other minor products.

VIII. The Manufacture of Forest Products (2 weeks)

A. Lumber, plywood, pulp and paper, chipboard.
B. Chemical by-products

IX. Selling Your Timber (1 week)

A. Contracts
B. Permits to cut

X. Forest Taxation (½ week)

XI. Fire and Fire Protection (½ week)

XII. Forest Diseases (1½ weeks)

A. Types of diseases, their characteristics, and how to recognize.
1. Virus
2. Bacteria
3. Fungi

B. Controls and Treatment

XIII. Forest Insects, Life Cycle, Effects, Controls (½ week)

A. Bark beetle
B. Hemlock looper
C. Spruce budworm
D. Others

XIV. Elements of Cruising Timber Stands (1 week)

A. Measuring trees
B. Surveying
C. Construction of a cruising stick
D. Field problem work

XV. Forest Regeneration (reforestation) (1 week)

A. Ground preparation
B. Selection of species
C. Planting techniques

XVI. The Interrelationship of Forests to Fish and Game Populations and Management. (½ week)

XVII. Forestry Careers and Job Opportunities (1 week)

COURSE OUTLINE AT GERVAIS HIGH SCHOOL, GERVAIS, OREGON

CONSERVATION

Topic	*Source Materials*	*Audio-Visual Aids*
1. Definition of Conservation	"Conservation in U. S." — Highsmith	
2. Climate, Life Zones, Watershed Drainage SCS Districts Cultivated Areas	Maps and overlays from SCS (Soil Conservation Service, USDA)	Slides — "Soils of Oregon"
3. Soil pH	SCS Publications	Lab — take pH of profiles
4. Land Classifications	Charts & Publications Text	
5. Composition of the Earth a. Change, residual, transported soils b. Rock types c. Important elements	Geology Books & Text	Film — "Rocks and Minerals"
6. Geologic Ages, Lava, Rock Formers	Geology Books	"Eternal Gem"
7. Big Game Management — Deer, Elk, Bear, etc. a. State game laws b. Hunting safety	Game Commission	Films — "Behind the Trophy", "Hunting the Puma", "Shooting Safety"
8. Bird Management — Upland Game & Waterfowl a. Hunting regulations — bag limits, etc. b. Game farms (past & present)	Game Commission U.S. Fish & Wildlife Service	Speakers Film — "Malheur Wildlife Refuge"
9. Ore. State Game Commission a. Divisions b. Policies	Game Commission	Speaker
10. Fish Conservation a. Management b. Migration c. Life histories d. Food chains	Game Commission	Many films
11. Multiple Use of Our Forests	Text U.S. Forest Service	Many films

Topic	*Source Materials*	*Audio-Visual Aids*
12. Forests a. Ownerships b. Identification of trees c. Physiology of trees d. Logging & milling e. Diseases f. Fires g. Tree farms h. Forest regions and ranger districts i. Ecology of the forest	U.S. Forest Service Text (tolerant & intolerant)	Films such as: "Promise of Tree" "Forests at Work" "Enemy is Fire" "New Paul Bunyan" "Battle of Beetles" "Conifer Trees"
13. Recreation & Camping in Ore. Camping facilities, cost & number	U.S. Forest Service State Parks Dept.	Maps, guides, pictures
14. Water Resources a. Hydrologic cycle b. Uses of water c. Water zones d. Sewage disposal e. Causes of pollution f. Irrigation g. Water rights	Text Various publications (basically the Federal Government)	Films — "Clean Water" "City Water Supply" "H_2O — Fountain of Life" Trip to sewage disposal plant
15. Dams and Reclamation a. Major U. S. dams b. Irrigation projects c. TVA	U.S. Dept. of Interior	Trip to Bonneville Various films
16. Wilderness Areas of Oregon a. Backpacking b. High mountain lakes c. Oregon Skyline Trail	Wilderness Society U. S. Forest Service	Pictures
17. Wildlife Refuges	U. S. Fish & Wildlife	"Trip to Malheur"
18. Ecology of Oregon		"Web of Life"-Storer Pond collecting Films from County School office
19. Small Birds of Oregon	"Birds"—Roger T. Peterson	Field trips

COURSE OUTLINE IN FARM FORESTRY AT VERNONIA HIGH SCHOOL

I. Freshman Year

- A. Introduction to farm industry — 1-2 hours
  - 1. Significance to the local economy
  - 2. Significance to the national economy
  - 3. Significance to watershed and wildlife management
  - 4. Esthetic contributions to modern life
- B. Tree Identification — 2 hours
  - 1. Important local softwoods
  - 2. Distinguishing characteristics of the softwoods
  - 3. Uses of local softwood species
- C. Selection of species and site — 3 hours
  - 1. Christmas trees
  - 2. Forest reproduction
- D. Principles of hand planting — 1 hour

II. Sophomore Year

- A. Identification of all locally significant tree species — 2 hours
- B. Christmas tree production — 1 hour
  - 1. Buying young trees
  - 2. Groundbreaking and soil preparation techniques
  - 3. Caring for the young trees
- C. Techniques of tree planting — 1 hour
  - 1. Local soil types and tree growth reaction
  - 2. Ecological consideration
- D. Techniques of management — 4 hours
  - 1. Management for maximum Christmas tree production
    - a. culling
    - b. thinning
    - c. pruning
  - 2. Management for maximum nursery production
    - a. thinning
    - b. weeding
    - c. irrigation
    - d. soil preparation
- E. Techniques of harvesting — 3 hours
  - 1. Principles of multiple-use management
  - 2. Selective cutting
  - 3. Planning for harvest
- F. Forest protection — 2 hours
  - 1. Forest fire fighting and fire prevention
    - a. Fire behavior
    - b. Fire fighting techniques
    - c. Fire fighting equipment
  - 2. The safe use of fire

G. Types and uses of specialty forest products — 1 hour

  1. Pulpwood
  2. Fuelwood
  3. Cascara
  4. Conifer cones
  5. Decorative greenery

III. Junior Year

A. Techniques of tree planting — 1/2 hour

  1. Principles of machine planting
  2. Airplane and helicopter planting

B. Techniques of cruising and scaling — 2 hours

  1. The land cruise as a measure of forest volume
  2. The use of biltmore stick and hypsometer
  3. Forest mathematics — computing board feet from standing and fallen timber

C. Techniques of management — 3 hours

  1. Factors affecting the forest markets
  2. Economical consideration in forest production
  3. Analysis of costs and returns for forestry enterprises

D. Forest protection — 2 hours

  1. Local insect and disease problems
  2. Control measures for locally significant insects and diseases

E. Specialty forest products — 1 hour

  1. Shake and shingle production
  2. Fence post production
  3. Piling and pole production

F. Marketing forest products — 3 hours

  1. The various forms in which forest products are marketed
  2. Methods of handling forest products before and enroute to market

G. Christmas tree production — 2 hours

  1. Thinning the stand
  2. Pruning
  3. Choosing trees for sale
  4. Correcting deformities

IV. Senior Year

A. Identification — 2 hours

  1. Wood identification — locally significant species
  2. Identification of the various wood products

B. Techniques of harvesting — 4 hours

  1. Road and log landing planning and construction
  2. Falling, bucking, and skidding
  3. Cat and hi-lead harvesting
  4. Laws concerning harvesting

C. Techniques of management 1 hour

  1. Forest record keeping
  2. Determining labor and equipment needs

D. Wood preservation 1 hour

  1. Uses of preserved products
  2. Types of preservatives
  3. Methods of applying preservatives

E. Forest protection 1 hour

  1. The various protection agencies locally important and their work
  2. Forest protection laws

F. Marketing forest products 1 hour

  1. Supply and demand influences on products movement
  2. The local market situation — markets and price structure

G. Forest mechanization 3 hours

  1. What are the "tools of the trade"
  2. Using and maintaining special equipment

H. Forest occupations 2 hours

  1. The various job possibilities
  2. Entry qualifications
  3. Professional possibilities
  4. Local needs

I. Forest products 3 hours

  1. Lumber manufacture
  2. Veneer manufacture
  3. Pulp and paper production
  4. Hardboard and fiberboard production

GENERAL CONSERVATION COURSE

I. History of Conservation Movement

A. Use, waste, depletion

B. Establishment of government occupancy

  1. National Forests
  2. National Parks
  3. Public Domain
  4. State and local

II. Study of Soils

A. Soil classifications

B. Soil fertility and relationships to crops

C. Soil erosion

  1. Cause and effect
  2. Special and economic significance
  3. Control methods

III. Study of Water

A. Watershed, public and private

B. Water uses

  1. Domestic
  2. Municipal
  3. Industrial
  4. Recreational
  5. Hydroelectric

- C. Drainage and reclamation
- D. Problems of water resource management

IV. Study of Plant Life

- A. Small plants
- B. Forage — rangeland
- C. Trees
    1. Economic importance
    2. Damage
    3. Regeneration

V. Study of Animal Life

- A. Habitat requirements
- B. Types of life within geographic zones
- C. Population balances
    1. Predators
    2. Disease
    3. Hunters

VI. Study of Minerals

- A. Economic importance
- B. Depletion impact on civilization
- C. Technological advancements in discovery, utilization, substitutions

VII. Interrelationships of resources

- A. Significance and scope of interrelationships
- B. Effect of exploitation on balance, multiple-use concept

VIII. Impact of Uses on Resources

- A. Social-economic
- B. National emergency
- C. Politics
- D. Future

7 - BIBLIOGRAPHY OF SOME CONSERVATION TEACHING MATERIALS

There are a great many publications that deal with natural resources, natural resource use, and outdoor education. This is a partial list of some of the literature that is available and some agencies and organizations that offer free or inexpensive teaching aids.

INEXPENSIVE BOOKS AND PAMPHLETS

	Approx. Cost
A Chart for the Development of Basic Conservation Concepts in the Elementary Grades, Ohio Forestry Association, Southern Hotel, Columbus, Ohio	$2.00
American Wildlife & Plants, Martin & Zim Dover T 793, 1961	3.00
Boy Scout Merit Badge Pamphlets	.35
Classroom Activities Related to Natural Resources Bureau of Indian Affairs, Dept. of Interior, Washington, D. C.	.25
Concepts of Conservation The Conservation Foundation, 30 East 40th St., New York 16	1.00
Conservation, Campfire Girls, Inc. (Booklet of Outdoor projects)	1.50
Conservation Education — A selected bibliography (Publication of the Conservation Education Association), the Interstate Printers & Publishers, Inc., Danville, Illinois.	
Conservation for Camp and Classroom, Bale Burgess Publishing Company, Minneapolis, Minnesota	3.00
Conservation of the Campsite American Camping Association, Inc., Martinsville, Indiana	1.00
Conservation Quickies (A set of classroom activities) Interstate Press, Danville, Illinois, 1968	1.50
Curriculum Enrichment — Outdoor, Hug and Wilson Harper & Row, 1966	3.00
Education — Key to Conservation (Set of booklets by the Conservation Education Association) Key #1. Important Characteristics of a Good Local Program. Key #2. Planning a State Program of Conservation Education. Key #3. 25 Key Guides for Preparing Conservation Education Publication and Visual Aids. Key #4. Evaluating a Program of Conservation Education in the Elementary School. (Interstate Printers & Publishers, Inc., Danville, Illinois)	1.00 /Set
Field Study Manual to Outdoor Learning, Burgess Publishing Co., Milliken, McDonald, Hamer, 1968	2.35

Field Trips, Nickelsburg Burgess Publishing Co., 1964	2.00
Glory Trail, Ernest Swift — "The great American migration and its impact on natural resources." National Wildlife Federation, Washington, D. C., 1958	—
Golden Nature Series Guides, Zim	1.00
Guide to Wildlife Feeding Injuries on Conifers in the Pacific Northwest, Lawrence, et al, Western Forestry & Conservation Association, 712 U. S. National Bank Bldg., Portland, Oregon	1.75
Guidelines to Conservation Education Action Isaac Walton League, 1326 Waukegan Rd., Glenview, Illinois	2.50
Indian Legends of the Pacific Northwest, Ella Clark University of California Press	2.00
Learning About Soil and Water Conservation, Fox & Rotter Johnsen Publishing Co., Lincoln, Illinois (Workbook, Gr. 3-5)	.60
Manual for Outdoor Laboratories, Weaver Interstate Printers & Publishers, Inc., Danville, Illinois	1.50
Natural Resource Use in Our Economy, With Study Aids, Stead Joint Council on Economic Education, 2 West 46th St., New York, N. Y. 36	1.50
Nature Centers & Outdoor Conservation Education Books Audubon Society, 1130-5th Ave., New York, N. Y. 10028 1. A Nature Center for Your Community 2. Planning a Nature Center 3. Manual of Outdoor Conservation Education 4. Trail Planning & Layout 5. Wildlife Habitat Improvement	2.00 each
Resources of Tomorrow, Henry Becker Holt Rinehart & Winston, Inc. (American Problem Series)	1.00
Teaching in the Outdoors, Hammerman & Hammerman Burgess Publishing Co., 1964.	3.00
Techniques for Teaching Conservation Education, Brown, Mouser Burgess Publishing Co., 1964.	3.00
The Forest and the Sea, Marston Bates A Mentor Pocket Book	.60
The Web of Life, John Storer Signet Pocket Science Series	.60
You and Conservation (A checklist) American Camping Association, Inc., Martinsdale, Indiana	.10

BOOKS

Atlas of the Pacific Northwest, Resources & Development, Highsmith Oregon State University, Corvallis, Oregon

Conservation — in the People's Hands, American Association of School Administration, 1964.

Conserving American Resources, Parsons (Prentice Hall, 1964)

Conserving Natural Resources, Shirley Allen (McGraw, 1959)

Deserts on the March, Paul B. Sears (U. of Oklahoma, 1959)

Environmental Conservation, Ray Dasman (Wiley)

Field Book of Nature Activities and Conservation, Hillcourt, (Putman)

Find a Career in Conservation, Jean Smith (Putnam, 1959, Gr. 5-9)

First Book of Conservation, Frances C. Smith, (Putnam, 1959, Gr. 4-7)

Fish and Wildlife, Carroll B. Colby (Coward, 1955, Gr. 5-8)

Future Environments of North America, Natural History Press, Garden City, New York, 1966)

Gifts from the Forest, Gertrude Wall (Scribner, 1958, Gr. 5-8)

Handbook for Teaching Conservation and Resource Use
National Association of Biology Teachers

Living Earth, Farb (Harper, 1959)

Our Friend the Forest, Patricia Lauber (Doubleday, 1959, Gr. 2-6)

Our Mineral Resources, An Elementary Textbook in Economic Geology, Riley (Wiley)

Our Wildlife Legacy, Durward L. Allen (Funk, 1953)

Outdoor Education, Smith, et al (Prentice Hall, 1964)

Politics and Conservation, Pooley (Harper)

Recreational Use of Wild Lands, Brockman (McGraw Hill, 1959)

Resources in America's Future, Landberg, Fischman, Fisher (Patterns of Requirements & Availabilities 1960-2000), published for Resources for the Future, Inc., by John Hopkins Press.

Riches from the Earth, Carroll L. Fenton (Day, Gr. 6-9, 1953)

Seeing America's Wildlife, Devereux Butcher (Devin)

Soil Savers, Carroll B. Colby (Coward, 1957, Gr. 3-6)

Some U. S. Department of Agriculture Yearbooks (Supt. of Documents, Washington, D. C.)

Grass — 1948
Trees — 1949
Water — 1955
Soil — 1957
Land — 1958
A Place to Live — 1963

(Each year a limited supply of the current yearbook is available free by writing your Congressman)

Teaching Science Through Conservation, Munzer, Brandwein
McGraw, 1960, 437 pgs.

Underground Riches, Walter Buehr (Morrow, 1958, Gr. 5-8)

Water for America, Van Dersal, Wm. & Ed Graham (Walck, 1956, Gr. 4-8)

Waterfowl Tomorrow, U. S. Dept. of Interior (Supt. of Documents, Washington, D. C.)

Water — or Your Life, Arthur Carhart (Lippincott, 1959)

Water! Our Most Valuable Natural Resource, Ivah Green (Coward, 1958, 4-8)

Water, Water Everywhere, Mary Walsh (Abinadon, 1953, Gr. 5-7)

Wildlife for America, Van Dersal, Wm. & Ed Graham (Walck, 1949, Gr. 6-9)

Wildlife Management, Ira Gabrielson (Macmillan, 1951)

Your Forests, Martha Bruere (Lippincott, 1957, Gr. 7-9)

SOME AGENCIES AND ORGANIZATIONS WITH FREE OR INEXPENSIVE MATERIALS (CONTACT THE LOCAL FIELD OFFICES IF POSSIBLE)

PORTLAND GENERAL ELECTRIC COMPANY, 621 S. W. Alder, Portland, Oregon 97205

U. S. ARMY CORPS OF ENGINEERS, 628 Pittock Block, Portland, Oregon 97205

BUREAU OF LAND MANAGEMENT, State Director, 729 N. E. Oregon, Portland, Oregon 97232

BUREAU OF INDIAN AFFAIRS, 1425 N. E. Irving, Portland, Oregon 97232

U. S. FOREST SERVICE, Regional Office, 319 S. W. Pine, Portland, Oregon 97204

WASHINGTON STATE GAME COMMISSION, 600 N. Capital Way, Olympia, Washington 98501

OREGON STATE GAME COMMISSION, 1634 S. W. Alder, Portland, Oregon 97205

U. S. SOIL CONSERVATION SERVICE, 1218 S. W. Washington, Portland, Oregon 97205

U. S. SOIL CONSERVATION SERVICE, Bon Marche Bldg., Spkane, Washington 99201

BUREAU OF SPORT FISHERIES & WILDLIFE, 710 N. E. Holladay, Portland, Oregon 97232

BUREAU OF COMMERCIAL FISHERIES, 811 N. E. Holladay, Portland, Oregon 97232

NATIONAL PARK SERVICE, 710 N. E. Holladay, Portland, Oregon 97232

BONNEVILLE POWER ADMINISTRATION, 1002 N. E. Holladay, Portland, Oregon 97232

FEDERAL WATER POLLUTION CONTROL ADMIN., Pittock Block, Portland, Oregon 97205

LOCAL COUNTY EXTENSION OFFICES

OTHER LOCAL AND STATE GOVERNMENT OFFICES in your area

THE CONSERVATION EDUCATION ASSOCIATION, c/o Dr. Will Clark, President
Eastern Montana State College, Billings, Montana 59101

THE JOINT COUNCIL ON ECONOMIC EDUCATION, 2 West 46th St., New York 10036
(Many publications on economic impact on natural resources)

KEEP AMERICA BEAUTIFUL, INC., 99 Park Ave., New York, New York 10016
(Litterbug material)

RESOURCES FOR THE FUTURE, INC., 1775 Massachusetts Ave. N.W., Washington, D.C. 20036
(water, supply, demand, and other)

NATIONAL AUDUBON SOCIETY, 1130 5th Ave., New Work, New York 10028

NATIONAL WILDLIFE FEDERATION, 232 Carroll St. N.W., Washington, D.C. 20012
(The Glory Trail and others)

STANDARD OIL COMPANY OF CALIFORNIA, 225 Bush St., San Francisco, Calif. 94104
(litterbug and mineral conservation projects)

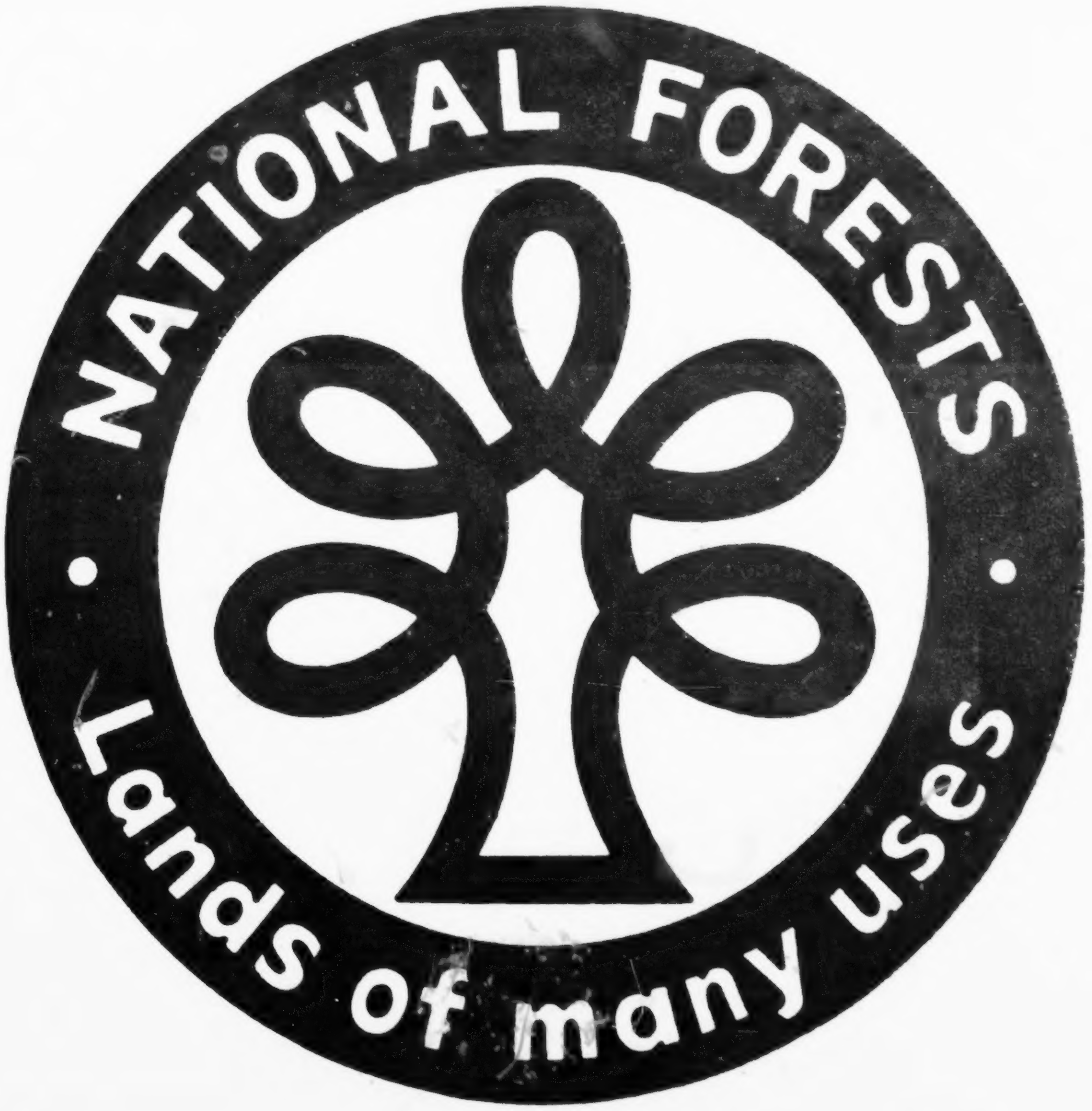
WILDERNESS SOCIETY, 2144 P Street, Washington, D. C. (need for wilderness)

WEYERHAEUSER TIMBER COMPANY, Education Dept., Tacoma, Washington

CROWN ZELLERBACH CORPORATION, 343 Sansome Street, San Francisco, Calif. 94104

AMERICAN FOREST INDUSTRIES, 845 Pittock Block, Portland, Oregon 97205

GPO 992-644



The National Forest Symbol, based on a medieval symbol for wood, was created in December 1960.

Six elements make up the symbolic Multiple Use Tree, the central design within the ring. Five ovals stand for the five major resources of the National Forests — wood, water, forage, wildlife, and recreation — and represent as well the products and services flowing from these resources. The trunk of the Tree is symbolic of the Nation and its people who receive and benefit from these products and services.

Further symbolism in the Tree's design is obtained by using an unbroken line to link each resource with the other, and all five with the using public. The line establishes the interrelationship and interdependence of the six elements. Its continuity further symbolizes multiple use management by indicating that each resource is developed and managed in coordination with each of the other resources, and that all are developed and managed to provide optimum benefits to the American people.